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A STUDY OF PUBLIC WORKS INVESTMENT IN THE UNITED STATES

Appendices

U.S. DEPARTMENT OF COMMERCE
Office of the Assistant Secretary for Policy
and
Economic Development Administration

A STUDY OF PUBLIC WORKS INVESTMENT IN THE UNITED STATES

Appendices

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for
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Volume IV
Appendices

INTRODUCTION

Volume IV of A Study of Public Works Investment in the United States consists of seven appendices and contains supplementary materials to Volumes I, II, and III of this study. Specifically, the seven appendices are:

A. Evaluation of Data Bases on PWI and Financing Mechanisms

B. Derivation of Constant Dollar PWI Data and Socioeconomic Variables for Regional Analysis

C. Review of Literature on PWI and Regional Development

D. Results of Telephone Survey of Capital Stock Conditions and Recommendations for Case Study Analysis

E. Performance Standards and Operational Definitions of Maintenance and Renovation

F. A History of Public Works in the United States: 1790-1970

G. Federal Agency Methods for Determining Public Works Investment Need

Each appendix is paginated independently, with the appendix letter preceding the page number. The detailed contents of each appendix can be found by referring to the Table of Contents for each appendix (which begins on page ii of each appendix).

APPENDIX A: EVALUATION OF DATA BASES ON PWI AND FINANCING MECHANISMS

TABLE OF CONTENTS

		Page
	LIST OF EXHIBITS	A.iv
1.0	INTRODUCTION	A.1
2.0	OVERVIEW OF PWI DATA BASES USED IN STUDY	A.2
2.1	Bureau of the Census Governments Division	A.2
2.1.1	Governmental Finances	A.2
2.1.2	State Government Finances	A.4
2.1.3	Other Governments Division Annual Publications	A.7
2.1.4	Five-Year Census of Governments	A.8
2.2	Bureau of Economic Analysis (BEA)	A.9
2.2.1	BEA Construction Estimates	A.9
2.2.2	BEA Equipment Estimates	A.13
2.2.3	BEA Data Used in PWI Study	A.13
2.3	Federal Information Exchange System	A.13
2.4	Independent Surveys	A.16
2.4.1	On-Site Visit Surveys	A.16
2.4.2	Mail or Phone Surveys	A.17
3.0	CRITICAL EVALUATION OF PWI DATA STRENGTHS AND WEAKNESSES	A.18
3.1	Bureau of the Census Governments Division	A.18
3.1.1	Strengths	A.18
3.1.2	Weaknesses	A.20
3.2	Bureau of Ecomomic Analysis	A.22
3.2.1	Strengths	A.22
3.2.2	Weaknesses	A.23
3.3	Federal Information Exchange System	A.24
3.3.1	Strengths	A.24
3.3.2	Weaknesses	A.25
3.4	Independent Surveys	A.28
3.4.1	Strengths	A.28
3.4.2	Weaknesses	A.28

TABLE OF CONTENTS (Continued)

		Page
3.5	Comparability Between PWI Data Sources	A.29
3.5.1	Comparative Analysis of BEA and Census Governments Division PWI	A.29
3.5.2	Analysis of Variance in Federal PWI	A.33
4.0	RECOMMENDATIONS FOR IMPROVING THE QUALITY OF PWI DATA	A.41
4.1	Centralization of the Data Collection Process	A.41
4.2	Design of a Comprehensive Methodology For the Collection of PWI Data	A.42
4.3	Automation of PWI Data	A.43
5.0	SUMMARY AND CONCLUSIONS	A.44

LIST OF EXHIBITS

Exhibit Number		Page
2.1	Census of Governments Volumes Containing Capital Outlay Data Relevant to PWI Study	A.10
2.2	Functional Categories for BEA State and Local Government Capital Outlays	A.14
3.1	Summary of Data Strengths and Weaknesses by PWI Source	A.19
3.2	Comparison of Census and BEA Construction and Equipment Expenditures, By Level of Government (in millions of dollars)	A.30
3.3	Comparison of Trends in Federal PWI Using BEA and Census Data	A.34
3.4	Comparison of Trends in Federal PWI as a Percentage of GNP Using BEA and Census Data	A.35
3.5	Federal Outlays for Non-Defense Construction as Reported by Census Governments Division and BEA	A.37
3.6	Federal Outlays for Non-Defense Equipment and Land and Existing Structures Purchased By Census Governments Division and BEA	A.39

1.0 INTRODUCTION

There are essentially two basic methods which can be used to collect and develop a data series. The first is to pull together data from various secondary data sources, selectively choosing those data considered to be relevant, and eliminating all other data. The second is to employ the use of a sample survey to gather data of a specific nature. In developing a public works investment (PWI) series for use in this study of PWI, a combination of both data collection methods was employed. In this appendix, the content of the various data series used in this study is discussed, describing their characteristics and analyzing their strengths and weaknesses. Where secondary data sources were used, this translates to an evaluation of the secondary data sources themselves. In all, PWI data from four sources are evaluated. These sources are:

- Bureau of the Census (Governments Division);
- Bureau of Economic Analysis;
- Federal Information Exchange System; and
- Independent Surveys.

In Chapter 2.0 an overview of these data sources is presented, where the characteristics of the PWI data in each source are discussed. In Chapter 3.0, the discussion moves from descriptive to evaluative. Here the strengths and weaknesses of the PWI data are reviewed. As part of this analysis, a comparative assessment is made of data from the BEA and the Census Governments Division -- the two largest secondary sources of PWI data. Based upon the analysis in Chapter 3.0, several recommendations are made for improving the quality of PWI data. These are presented and discussed in Chapter 4.0. Finally, Chapter 5.0 provides a summary and some concluding remarks.

2.0 OVERVIEW OF PWI DATA BASES USED IN STUDY

2.1 Bureau of the Census Governments Division

The Governments Division is one of two divisions within the Bureau of the Census which compiles data on public works expenditures.[1] These PWI data are published yearly in a number of Governments Division publications, the most important of which are:

- Five-Year Census of Governments
- Governmental Finances
- State Government Finances
- City Government Finances
- County Government Finances
- Local Government Finances in Selected Metropolitan Areas and Large Counties

The Governments Division PWI data are on a fiscal year basis and distinguish between three types of capital outlays: (a) construction, (b) equipment, and (c) land and existing structures.

2.1.1 Governmental Finances

This annual publication contains capital outlay data on Federal, state and local governments in summary form. Federal government capital outlays are obtained from several sources. Estimates of Federal construction outlays are obtained from the Budget Special Analyses, except for the Tennessee Valley Authority which provides construction estimates directly to the Governments Division. Purchases of equipment by the Federal government are essentially those published by OMB in the Budget Appendix under object classification code 31, while land and existing structure purchases are estimated from data provided by the Justice Department. All Federal PWI data is collected on an agency by agency basis and grouped into functional categories based upon each agency's functional orientation.

State government finance statistics are based upon data compiled at the Bureau of the Census from official records and reports of the various states. More detailed figures appear in the State Government Finances publication which is discussed below.

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[1] The other division is the Census Construction Division which is discussed in Section 2.2.

Local government data has been compiled since 1957 and is based upon a random sample of 16,000 local units. The composition of the sample includes all county governments and municipalities with a population greater than a specified amount.[1] The sample also includes governments whose relative importance in their state, based upon expenditure or debt, is above a specified amount. The remaining local governments are randomly selected from a compilation of all local governments within selected large SMSA's, other major counties, and the balance of the state. Upon completion, the local government sample is then blown up to represent the universe. Census sources indicated that, with a two-thirds confidence, the interval constructed around this sample will include the true population value.

In terms of data availability, various issues of this publication proved useful in structuring the following outlay data series:

(1) A time series extending back to 1957 of Federal, state, and local government outlays on construction, equipment, and land and structures. The series is in current dollars and is on a fiscal year basis.

(2) A time series covering the 1957-1977 period of Federal, state and local construction and total capital outlays for the following functional categories:

- National defense
- Education
  - Local schools
  - Institutions of higher education
  - Other
- Highways
- Health and hospitals
- Sewerage
- Local parks and recreation
- Natural resources
- Housing and urban renewal
- Air transportation
- Water transport and terminals
- Local utilities
  - Water supply
  - Electric power
  - Transit
  - Gas supply.

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[1] This specified population figure changes over time and is based upon the decennial Census of Population.

(3) Total local government capital outlays within each state (including the District of Columbia) for five functional categories, extending back to 1961:

- Education
- Highways
- Health and hospitals
- Sewerage
- Local utilities
  - Water utilities
  - All other local utilities.

A number of data series were utilized that relate to the financing of local government expenditures as well. However, these data suffer in the context of PWI in that it is virtually impossible to identify or disaggregate revenues used for operating or capital purposes except at a national aggregate level. The following variables were identified from the publication for the time period of this study:

- Total general revenue
  - Intergovernmental revenue from Federal government
  - Intergovernmental revenue from other sources (state-local)
  - All general revenue from own sources
    -- Total taxes
       --- Property taxes
       --- Other taxes
- Total debt outstanding
  - Total short-term outstanding
  - Total long-term outstanding
    -- Total general obligation debt (excluding utility debt)
- Long-term debt issues
- Long-term debt retired.

2.1.2 State Government Finances

Annual reporting of state government finances by the Census Governments Division began in 1915 and has continued regularly except for 1920, 1921 and 1933-1936. As indicated above, the data on state capital outlays is compiled directly from official state recrods and reports by Census personnel.

There are essentially three important data series in the State Government Finance publications which were useful in the analysis of state government capital outlays:

(1) A time series covering the 1957-1977 period for construction, equipment, and land and existing structure capital outlays for the aggregate of all states, by 20 functional categories:

- Education
- Public Welfare
- Highways
- Hospitals
- Natural Resources
- Health
- Correction
- Financial Administration
- Employment Security Administration
- Police Protection
- General Control
- Protective Inspection and Regulation, N.E.C.
- Miscellaneous Commercial Activities
- Housing and Urban Renewal
- General Public Buildings
- Airports
- Water Transport and Terminals
- Libraries
- Veterans Services
- Liquor Stores.

(2) A time series on construction, equipment, and land and existing structure capital outlays by each state for the entire 1957-1977 period.

(3) Total capital outlays by each state over the 1957-1977 period for the following functional categories:

- Education-Construction Outlay also distinguished
- Highways-Construction Outlay also distinguished
- Correction
- Hospitals
- Miscellaneous Commercial Activities
- General Public Buildings
- Water Transport and Terminals
- Public Welfare
- Natural Resources
- Liquor Stores
- General Expenditure, N.E.C.

In addition, the following relevant variables were identified and utilized for the analysis of the financing of state government expenditures:

- Total general revenue
  - Total tax revenue
  - Total sales and gross receipts
    -- Total general sales and gross receipts
  - Total licenses
  - Individual income tax
  - Net corporate income tax
  - Total property tax
  - Motor fuel tax
  - Public utility tax
  - Motor vehicle license tax
  - Motor vehicle operator license tax
  - Public utility license tax
- Total intergovernmental revenue
  - Federal government
    -- Education
    -- Highways
    -- Health and hospitals
    -- Natural resources
    -- Airports
  - From local governments
    -- Education
    -- Highways
    -- Health and hospitals
- Total general revenue from current charges
  - For education
  - For highways
  - For health and hospitals
  - For natural resources
  - For airports
  - For water transport and terminals
  - For public safety
- Total general revenue sharing (from 1973 on)
- Total from Federal government for non-highway transportation

- Total debt outstanding

  - Total long-term
    -- Total full-faith and credit
       --- General obligation bonds
       --- Specified non-tax based
       --- Non-guaranteed debt
  - Long-term debt by function
    -- Education
    -- Highways
    -- Hospitals
    -- Water transport and terminals
    -- Public safety
    -- Natural resources
    -- Non-highway transportation

2.1.3 Other Governments Division
Annual Publications

Other Census publications containing annual government finance data are:

- City Government Finances: published annually since 1902, this source contains financing data related to municipal operations and their dependent agencies.[1] Coverage has varied throughout this period. Presently, 401 cities and urban townships with a population greater than 50,000 are covered. From 1957 to 1960 the minimum population criterion was 25,000.

- County Government Finances: published annually since 1973, this source contains finance data on all large county governments, and a selected sample of smaller county governments. Essentially, three criteria are utilized in selecting counties for inclusion:

  - All counties with a population greater than 500,000 are visited by qualified Census Bureau representatives who compile financial data from the official county reports and records.
  - Information for counties with a population between 100,000 and 500,000 is supplied by local officials in response to a mail canvass involving the use of detailed Census questionnaires.

[1] Finances of other local governments overlying city areas are not included.

- Data for counties less than 100,000 is based upon a sample which includes all counties with a population between 50,000 and 99,000 and a randomly selected sample of smaller counties.

Like city government finances, data in this report do not include amounts for other local governments within or among county areas.

- Local Government Finances in Selected Metropolitan Areas and Large Counties: published annually since 1964, this source contains financial data on a selected sample of SMSAs and local government units within the SMSAs. Data reported represent estimates based on information collected primarily from mail questionnaires. Coverage since 1964 has varied quite significantly:

1964-1969	30 SMSAs
1970-1972	72 SMSAs
1973-Present	74 SMSAs

Prior to 1970, data was publised only for the SMSAs and counties within the SMSAs. Smaller local governments (e.g., school districts or special districts) finances were not displayed.

Of these publications, only data from City Government Finances was used in the PWI study. While containing some useful information, the limited temporal coverage of County Government Finances and Local Government Finances in Selected Metropolitan Areas and Large Counties precluded their applicability. Moreover, except for the analysis of local financing mechanisms and maintenance and renovation PWI, the focus on the spatial distribution of PWI was limited to the state and Census Region level.

2.1.4 Five-Year Census of Governments

The Census of Governments has been published every five years since 1957. The primary difference between the five-year Census of Governments and the annual Census is in the coverage of local governments. In the five-year Census, financial data is collected on all local governments within the United States, either through direct examination of local government records or reports, or through mail canvassing. The annual Census, on the other hand, covers only approximately 16,000 local units. However, there is little difference between the annual and five-year Census in the type of capital outlay data published. Federal and state government coverage is identical, and both report outlays for only selected localities, although the level of functional detail on local government capital outlays is greater in

some instances in the five year Census of Governments. Consequently, since the previous section illustrated the type and format of local government PWI data published by the Census of Governments Division, similar representations will not be repeated here. Instead, the focus is on identifying those volumes in the massive Census of Governments where relevant government capital expenditure data resides. Such a tabulation, together with a brief descriptive summary of each relevant source is presented in Exhibit 2.1.[1]

2.2 Bureau of Economic Analysis (BEA)

As part of compiling the National Income and Product Accounts, the BEA puts together a separate series on government capital expenditures. This series, known as the BEA government capital formation series, contains current and constant dollar estimates of construction, equipment, and net purchases of existing structures by level of government (Federal, state, and local) going back to 1929. Except for estimates of total (i.e., combined Federal, state, and local) government construction and the identification of military capital expenditures, the published data series contain no functional or regional detail.[2]

2.2.1 BEA Construction Estimates

For construction, the BEA essentially uses the value of new construction put-in-place data series compiled by the Census Construction Division.[3] This series estimates the value of new public construction by Federal, state and local governments. The series, which goes back to 1915, is published annually as well as montly in Value of New Construction Put-in-Place, is on a calendar-year basis, and is published in both current and constant dollars.

Value put-in-place estimates for Federal construction are based upon monthly data which, for the most part, are supplied to the Census Construction Division directly by Federal agencies. Federal agencies which have construction programs less than $15 million per year do not

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[1] The Census of Governments data was limited in its usefulness with regard to our analyses, since we required continuous time series data, and the Census of Governments data are not published on an annual basis.

[2] The BEA Government capital formation series is published annually in the July Survey of Current Business.

[3] BEA uses the Census data for non-defense construction. For military construction, BEA makes in-house adjustments in some years.

Exhibit 2.1: Census of Governments Volumes Containing Capital Outlay Data Relevant to PWI Study[1]

Volume	Summary Description
Volume 4, No. 1: Finances of School Districts	Finances of approximately 15,800 school districts existing as separate units of local government. Financial data based mainly on information received in response to a mail survey of all school districts in U.S.
Volume 4, No. 2: Finances of Special Districts	Financial data based mainly on information received in response to a mail canvass covering all special districts in U.S.--about 23,900 units, or 30 percent of the total number of local government agencies canvassed for 1972 Census of Governments.
Volume 4, No. 3: Finances of County Governments	Financial data for all of 3,044 county governments in existence in 1972. These governments represent only 4 percent of the total number of local governments but account for approximately 20 percent of local government revenue and expenditure totals. Approximately 2/3 of data obtained by on-site examination of records, with remainder of data coming from a mail canvass.
Volume 4, No. 4: Finances of Municipalities and Township Governments	Finances of approximately 18,516 municipalities and 17,000 townships, based mainly on information received in response to a mail survey. Municipalities are defined to consist of municipal corporations set up to provide a variety of local public services for areas of relatively concentrated population. This category includes units officially termed cities, villages, boroughs (except for Alaska) and towns (except in New York, Wisconsin, and New England where towns are classified as townships). Townships serve inhabitants of areas defined without regard to population concentration. Townships exist in 21 states and are typically rural government units.
Volume 4, No. 5: Compendium of Government Finances	Essentially the data reported in this document is a reprint or summary of data contained in the above individual publications on local government finances, plus data in Governmental Finances and State Government Finances.
Volume 5: Local Government in Metropolitan Areas	Financial statistics on all 277 SMSA's and local governments inside and outside the SMSA's. Statistics in this report include data published in Volume 1, 2, and 4 of the Census of Governments.

[1]Descriptive summaries based upon 1972 Census of Governments

supply information; construction expenditures by these agencies are obtained by the Census Construction Division from fiscal year outlays shown in the Federal budget. They then put this data on a calendar year basis using a simple straight line approach; for example:

$$.50\left(\begin{matrix}\text{1975 Fiscal}\\ \text{Year Value}\end{matrix}\right) + .50\left(\begin{matrix}\text{1976 Fiscal}\\ \text{Year Value}\end{matrix}\right) = \begin{matrix}\text{1975 Calendar}\\ \text{Year Value}\end{matrix}^{1}$$

For the period going back to 1947 the Federal government statistics are separated from the state and local (combined) statistics for nine functional categories:

- Buildings
  - Housing
  - Industrial
  - Educational
  - Hospital
  - Other
- Highways and Streets
- Military Facilities
- Conservation and Development
- Miscellaneous Federal

Disaggregation of Federal construction outlays into the nine functional categories is generally accomplished by allocating the entire expenditure of each Federal agency to a specific functional category. However, some agencies report additional detail, and their expenditures are allocated to more than one functional category. In total, 40 Federal agencies are covered by the value put-in-place series. Coverage is judged to be 95 percent of all Federal construction outlays, with the 5 percent undercoverage primarily limited to defense agencies. A "blow-up" factor is not used to compensate for the undercoverage.

For estimating state and local value put-in-place, three different procedures have been utilized by the Construction Division over the past 20 years:

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[1] For 1977 and beyond, the weighting coefficients are .75 and .25, reflecting the change in the Federal fiscal year definition.

- From 1975 to present, the Census has been utilizing the F.W. Dodge series on contract awards on a monthly basis. A stratified sample of the monthly contract awards is used as the basis to directly survey the relevant project officers in the public agency involved. From then on, the survey keeps track of the value of construction put-in-place for each project. The sample is stratified according to size of contract; all projects above a certain size are sampled. A minor "factor" is used to adjust for the portion not sampled as well as the portion of the universe that is judged not to be covered by F.W. Dodge.

- From 1968 to 1974 the series was based on an agency rather than a project basis. The Census Governments Division provided construction expenditures on a sample of local agencies (about 4,200 of the approximately 18,000 agencies were sampled) to the Construction Division. The primary weaknesses of this procedure are first, that agency expenditures (e.g., of a state highway department) were classified into major functional category regardless of project type, and secondly, that expenditures rather than the value of what was put-in-place was typically measured.

- Prior to 1968, the F.W. Dodge survey was again being used. A direct survey was not used. Instead, the contract awards were phased to simulate a put-in-place concept. The award amount was scaled to adjust for undercoverage and architectural fees.

Like the Federal construction value put-in-place estimates, the state and local estimates are functionally distributed. Nine functional expenditure types are identified:

- Buildings
  - Housing and redevelopment
  - Education
  - Hospital
  - Other
- Highways and Streets
- Conservation and Development
- Sewer Systems
- Water Supply Facilities
- Miscellaneous.

Finally, combined Federal, state and local construction value put-in-place estimates, by function, are published by BEA in Table 5.4 of the July issue of the Survey of Current Business.

2.2.2 BEA Equipment Estimates

BEA estimates of government durable equipment purchases are obtained from several different sources. Federal estimates of non-military equipment purchases are based upon object class obligation data published monthly by the Treasury Department in the Treasury Bulletin.[1] These data are statistically adjusted by BEA prior to publication in the Survey of Current Business. For state and local purchases of durable equipment, BEA uses the Census Governments Division equipment estimates, often converting from a fiscal to a calendar year basis.

2.2.3 BEA Data Used in PWI Study

For the PWI study, a current and constant dollar time series for the 1957-1977 period on aggregate (i.e., without functional or spatial detail) government capital formation was put together using the published BEA data.[2] This data was supplemented by unpublished BEA data detailing state and local (separately) capital formation between 1959 and 1977, by expenditure type (i.e., construction, equipment, and net purchase of existing structures), for 21 functional categories (see Exhibit 2.2). Because of its compatibility with the rest of the National Income and Product Accounts, this combined data series was useful in the analyses of PWI relative to other macroeconomic variables.

2.3 Federal Information Exchange System

A third source of useful data for the PWI study was the Federal Information Exchange System (FIXS). These data are compiled by the Community Services Administration (CSA) and detail the geographic

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[1] Military equipment estimates are made in-house based upon Department of Defense data.

[2] Three publication sources were used:

(1) Bureau of Economic Analysis, the National Income and Product Accounts of the United States, 1929-1974 (a supplement to the Survey of Current Business);

(2) Bureau of Economic Analysis, Survey of Current Business, July, 1977; and

(3) Bureau of Economic Analysis, Survey of Current Business, July, 1978.

Exhibit 2.2: Functional Categories for BEA State and Local Government Capital Outlays

Elementary and secondary education
Higher education
Other education and libraries
Health and hospitals
Public assistance
Police
Fire
Corrections
Highways
Water transport
Airports
Transit
Electricity
Water supply
Sewerage
Sanitation
Housing and urban renewal
All other government enterprises
Agriculture and natural resources
Parks and recreation
All other government, N.E.C.

distribution of Federal funds.[1] The FIXS goes back to 1968 and is a fairly comprehensive data series on the spatial distribution of the obligations of the Executive Branch of the Federal Government.[2] The data are organized by appropriation account using Office of Management and Budget (OMB) identification codes, and include all Federal agency programs, and indirect Federal support funds for every county of the United States and for each city with a population above 25,000. The data are available in both published and tape form, and can be organized by function, agency, outlay type (grant, procurement, etc.), program, and location.

Compilation and publication of the FIXS is performed by the CSA as an agent for the OMB, using OMB Circular No. A-84 as an instrumental guide in the data collection process. All data in the FIXS are supplied by the Federal agencies themselves, with the CSA restricted to a role of data processing and organization. Other than checking to see that the data reported by the agencies are formatted properly (i.e., consistency checks), CSA has no way of assuring the validity of the data.[3]

In the PWI study, the FIXS data was utilized to analyze the spatial distribution of PWI by the Federal government. However, unlike the other data series examined thus far, the paucity of temporal coverage available in the FIXS made it impossible to construct a comprehensive time series dating back to 1957. Moreover, attempts to construct a time series back to 1968, the year of inception, were hampered because of limited detail on expenditure type.[4] Consequently, analysis was eventually performed for only two years -- 1972 and 1977.

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[1] As suggested, the data pertain only to the Federal government. Thus, unlike the data sources examined so far, these data are not comprehensive across all governmental levels.

[2] Outlays by the Judicial and Legislative Branches are included only if there is a transfer of funds to an Executive agency.

[3] For a more in-depth discussion of the origins of the FIXS, see Thomas J. Anton, "Outlays Data and the Analysis of Federal Policy Impact", prepared for the Urban Impacts of Federal Policies Conference, Washington, D.C., February 8-9, 1979.

[4] Expenditure type in the FIXS is identified by "type of assistance codes". In general, if the type of assistance code indicates that the believed PWI appropriation account or program is a procurement outlay, then one can be reasonably sure that the funds within that account are used primarily for capital-related purposes. In the earlier years (i.e., prior to 1971), however, it is not possible to determine from the FIXS data which appropriation accounts or programs consist of procurement funds, thus hampering the identification of PWI funds.

As indicated above, the FIXS data are organized according to OMB appropriation identification codes, a scheme not inherently conducive to the analysis of Federal PWI since any appropriation account may contain both current and capital obligations.[1] However, there are certain accounts established for capital-related purposes, such as the construction of facilities. And while these accounts may contain obligations normally considered to be operational in nature (e.g., compensation for agency staff, services, etc.) most of the funds appropriated by Congress are used directly for construction or equipment purchases. Using information from the OMB identifying appropriation accounts in 1978 containing capital funds, a preliminary set of Federal PWI appropriation accounts was compiled. This set of accounts was then expanded based upon conversations with Federal agencies having large investment programs (e.g., Corps of Engineers, Bureau of Reclamation, Tennessee Valley Authority, etc.), and a subjective examination of the appropriation accounts in the 1972 and 1977 Budget Appendices. This "shopping list" of appropriation accounts was then compared against those available in the FIXS and a final set of Federal PWI appropriation accounts established.[2] The obligations associated with these accounts were those utilized to assess the spatial distribution of Federal PWI. The strengths and weaknesses of using such an approach are discussed in Section 3.3.

2.4 Independent Surveys

The fourth source of investment data for the PWI study was the use of independent surveys. These were of two types: actual on-site visits and mail or phone surveys. In relation to the other data discussed thus far, the data compiled from these sources is the only data, other than the FIXS outlays, gathered at the front of the informational hierarchy. In other words, even though the data were not originally collected by CONSAD, the data are truly primary. On the other hand, the data published by Census and BEA are secondary.

2.4.1 On-Site Visit Surveys

These surveys were conducted at selected cities throughout the United States and involved examining the city accounting records.[3] The data gathered during these visits varied in their temporal coverage, and detail. In general, however, the data were a useful source for analyzing

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[1] This is discussed in greater detail in Section 3.3.2.

[2] Due to undercoverage in the FIXS, not all appropriation accounts in the Budget which were considered to be capital oriented were found in the FIXS,

[3] A total of nine cities were visited: Baltimore, Dallas, Des Moines, Hartford, Newark, New Orleans, Pittsburgh, Seattle, and St. Louis.

the distinction between capital and maintenance outlays at the local level by function. In addition, data collected in this manner enabled the establishment of a linkage between expenditure type and financing mechanism (e.g., taxation, user fees, borrowing).[1] A more detailed description of the methodology employed in the site visits is provided in Volume II of this study.

2.4.2 Mail or Phone Surveys

In the mail/phone surveys a selected group of Federal agencies was contacted, and requested to provide data detailing the geographic distribution of their capital-related expenditures. The agencies contacted were those indicated by the OMB to be the largest public works investors. Out of the thirteen agencies contacted, eight provided series amenable to historical analysis. They were:

1) Corps of Engineers
2) Forest Service
3) National Park Service
4) National Aeronautics and Space Administration
5) Bureau of Reclamation
6) Tennessee Valley Authority
7) Bonneville Power Administration
8) Department of Defense

As with the data obtained from the on-site visits, the temporal coverage of the data varied -- extending anywhere from back to 1957 to 1966. In addition, not all of the data were actual capital expenditures. Some agencies provided obligations, other appropriations, and in the case of the BPA, net additions to physical plant. All data, however, were judged by the source agency to be of a PWI nature, although in some instances small amounts of current account items were included. For the DOD, military prime contract award data were utilized with all "military type" expenditures deleted. Finally, to discount the effect of the time lag between budget authority, obligation, and actual expenditure, and to smooth out any unrepresentative distributions, all data were placed on an annual basis.

In addition, a mail survey was conducted with finance officers who were members of the Municipal Finance Officers Association (MFOA). However, because of low valid response rates, difficulties experienced with disaggregating capital expenditures by revenue sources, and inconsistencies in accounting systems and reporting years, the data obtained from the mail survey provided little directly applicable or representative information on local government behavior. Instead, this information provided insight and qualitative guidance for trend analysis.

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[1] For a more detailed discussion of the character of the PWI data gathered during on-site visits, see the individual site visit reports contained in Volume II of this study.

3.0 CRITICAL EVALUATION OF PWI DATA STRENGTHS AND WEAKNESSES

In the previous section, we reviewed the various PWI data bases used in the study. There the emphasis was a descriptive one. In this section we examine the strengths and weaknesses of the PWI data, emphasizing the qualitative aspects of the data.

It is difficult to make any definitive statements regarding whether one data source is better than another, since each data source has its own peculiar set of strengths and weaknesses. A truly valid comparative assessment would require the assignment of weights to each strength and weakness -- a task extremely subjective and of questionable value. Instead, we chose to simply identify what the strengths and weaknesses of each data source are. These have been summarized in Exhibit 3.1 and are discussed in more detail below.

3.1 Bureau of the Census Governments Division

3.1.1 Strengths

a. Data are Centrally Compiled -- This is perhaps the greatest asset of using Census data. The data provide an easily accessible time series on PWI, freeing the analyst from having to piece together data from numerous and dispersed sources.

b. Comprehensive Governmental Coverage -- The Census of Governments data cover public works investments by three levels of government -- Federal, state, and local.

c. Distinction of PWI Expenditure Types -- For each level of government, the data separate total PWI into construction, equipment, and purchases of land and existing structures.

d. Grouping by Functional Category -- Total PWI by level of government is also separated according to its primary function -- the level of functional detail dependent upon the year and level of government being examined. PWI by individual states and local governments are also disaggregated by functional type.

Exhibit 3.1: Summary of Data Strengths and Weaknesses by PWI Source

SOURCE	STRENGTHS	WEAKNESSES
Bureau of the Census Governments Division	**Data are centrally compiled** Comprehensive governmental coverage Distinction between PWI expenditure types Grouping by functional category Spatial detail on state and local PWI Comparability between revenues and expenditures	Absence of quality control measures Absence of spatial detail on Federal PWI Lack of functional detail for PWI below national level Imprecise functional definitions Missing linkage between governmental revenues and PWI Measurement in current dollars only Measurement on fiscal year basis Changes in functional detail over time Construction PWI is not value put-in-place Lack of a consistent time series on individual small local governments Use of obligations to measure Federal equipment PWI
Bureau of Economic Analysis	**Data are centrally compiled** Comprehensive governmental coverage Distinction between PWI expenditure types Detailed functional breakdown at national level for state and local PWI Measurement on calendar year basis Measurement in both current and constant dollars Compatibility of PWI with national income and product accounts Construction measured as value put-in-place	Absence of quality control measures Lack of functional detail for Federal PWI Absence of spatial detail Missing linkage between governmental revenues and PWI Exclusion of land purchases Use of obligations to measure Federal equipment PWI
Federal Information Exchange System	**Data are centrally compiled** **Consistent with OMB reporting procedures** **Conducive to analysis by** • Function • Location • Type of Assistance • Agency	Federal obligation data only PWI not separately identified Absence of quality control measures Measurement in current dollars only Measurement on fiscal year basis Reliability of data below state level Changes in functional classifications over time
Independent Surveys:		
a. On-Site Visits	Precision control over data collection and management Linkage between revenues and PWI expenditures Identification of maintenance and renovation expenditures	Limited spatial coverage Measurement in current dollars Measurement on fiscal year basis
b. Mail/Phone Surveys	Precision control over data collection and management Spatial and temporal coverage	Limited agency coverage Incomparability between different types of outlays Measurement in current dollars Measurement on fiscal year basis

e. Spatial Detail on State and Local PWI -- The Governments Division data provide estimates of PWI by each state and all the localities within each state. Estimates of PWI for large cities and other selected local governmental units are also provided on an annual basis.[1]

f. Comparability Between Revenues and Expenditures -- In addition to publishing data on PWI, the Census Governments Division also collects data on governmental revenues. While the revenue data is not directly linked to PWI in particular, it is linked to governmental expenditure in general (i.e., total government expenditures), and thus is useful for analyzing variations in PWI levels.

3.1.2 Weaknesses

a. Absence of Quality Control -- Because the PWI data collected by the Governments Division is essentially secondary data, there are no adequate means for insuring consistency, both temporally and spatially. The Federal, state and local governmental units or agencies which are the primary data sources use different collection methodologies and classification schemes, and these frequently change from one year to the next.

b. Absence of Spatial Detail on Federal PWI -- One of the most critical shortcomings of the Census Governments PWI data is that the Federal PWI estimates are at the national level only. Without geographic detail, a spatial analysis of PWI is restricted to state and local PWI only. Since combined PWI by state and local government is significantly larger than Federal PWI, the effect of excluding Federal PWI from a spatial analysis of total PWI may not be that significant. On a functional basis, however, the impact may be quite large. For example, in FY 1977, the Federal government accounted for approximately 81 percent of natural resource investment by all levels of government.[2] Finally, in light of continuing questions regarding a fair and equitable distribution of Federal funds, the absence of spatial

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[1] The number of local governmental units covered increases during Census years.

[2] Bureau of the Census, Governments Division, Governmental Finances in 1976-1977.

detail on Federal PWI -- which may have larger secondary and/or external effects than other types of government spending -- becomes an increasingly critical data problem.

c. Lack of Functional Detail Below National Level -- While adequate at the national level, the functional detail available on PWI by individual states and localities is somewhat limited. This is particularly true for small local governments where only two or three functional types of PWI may be identified.

d. Imprecise Functional Definitions -- This is primarily related to the functional classification of Federal PWI, where entire agency expenditures are allocated to single functional categories. Thus, investment for road improvements by the National Park System may be included under the nature resources function.

e. Missing Linkage Between Governmental Revenues and PWI -- While there is comparability between total governmental expenditures and revenue, the Governments Division data does not directly identify the revenue sources or mechanisms used to fund PWI. Thus, other than the performance of superficial correlation or variance analyses, it is not possible to determine precisely how the level and composition of PWI is influenced by changes (whether they be legislative or market-oriented) in the availability of funding sources.

f. Measurement in Current Dollars Only -- The obvious problem here is that resource costs may be growing faster than nominal PWI, leading to misperceptions about the temporal and compositional growth/decline of PWI.

g. Measurement on Fiscal Year Basis -- This is primarily an issue of convenience. By being on a fiscal year basis, the analysis of PWI relative to socioeconomic variables, which are typically measured on a calender year basis, is made more difficult. In addition, not all governments are on the same fiscal year.

h. Changes in Functional Detail Over Time -- As might be expected, the level of functional detail for PWI has increased over time. This poses a problem when attempting to perform a time series analysis on individual functional expenditures.

i. Construction PWI Is Not Value Put-In-Place -- The conceptual weakness here is primarily one of timing. Timing refers to when a facility or project is actually built. The Governments Division construction data reflect governmental payment rather than the value of construction as it proceeds. Thus, construction outlays reported in one year may reflect construction in a previous year.

j. Lack of a Consistent Time Series on Small Local Governments -- Except for larger cities and large counties, the Government Division does not publish annual data on individual local governments. This poses a real problem in attempting to analyze PWI in small local areas.[1]

k. Use of Obligations to Measure Federal Equipment PWI -- The Governments Division estimates of Federal purchases of equipment are based upon obligations incurred rather than actual expenditures, thus presenting a consistency problem with the construction and land purchase PWI data. These obligations are obtained from the Budget Appendix, and are viewed with caution by Census personnel because of believed inconsistencies in the use of the equipment and material supplies OMB object class codes by the various Federal agencies.

3.2 Bureau of Economic Analysis

3.2.1 Strengths

a. Data Are Centrally Compiled -- Like the Governments Division, the BEA compiles PWI on an annual basis from several primary and secondary sources, thus offering an easily accessible time series on PWI.

b. Comprehensive Governmental Coverage and Distinction Between PWI Expenditure Types -- Again, like the Governments Division at the Bureau of the Census, the BEA data series detail PWI by level of government and expenditure type: construction, equipment, and net purchases of existing structures. The definitions of those expenditure types, however, differ from those of the Census Governments Division

[1] For the years 1967, and 1970-1976, the Census Governments Division possesses tapes detailing PWI for approximately 16,000 local governmental units, some of which are small areas. However, besides technical problems in copying the tapes, the composition of the sample varies every five years, presenting a constraint to the estimation of a time series on any given set of small local units.

c. Measurement on Calendar Year Basis -- All the BEA PWI data are on a calendar year basis and thus easily conducive to analysis relative to other socioeconomic variables.

d. Measurement in Current and Constant Dollars -- This is an important quality of the BEA data since it enables an analysis of PWI in real as well as nominal terms, and may be used to derive implicit price deflators.

e. Compatibility with National Income and Product Accounts -- Another important quality of the BEA PWI data is that it is estimated by BEA as part of the overall government expenditure component of GNP, and thus is compatible with the rest of the national income and product accounts. This allows for a useful analysis of PWI relative to such macroeconomic variables as GNP and gross private domestic investment.

f. Construction Measured As Value Put-In-Place -- For those years where the Census Construction Division used the F.W. Dodge data, the BEA state and local PWI estimates for construction embody the concept of value put-in-place, and thus accurately reflect the timing of the investment. Federal construction, however, is not value put-in-place.

g. Compatibility Between Revenues and Expenditures -- Like the Census Governments Division, BEA annually publishes estimates of Federal, and state and local (combined) revenues. Only national level estimates are published, and revenues are linked to governmental expenditures in general -- not PWI specifically.

3.2.2 Weaknesses

a. Absence of Quality Control Measures -- Like the Governments Division, the BEA relies primarily on secondary data sources and thus has no real means of insuring that the PWI data embody the economic concepts or possess the characteristics and structure it ideally desires.

b. Lack of Functional Detail For Federal PWI -- Except for estimates of construction by combined Federal, state and local governments, and the identification of military construction and equipment purchases, the published BEA estimates of Federal PWI do not contain any functional breakdown.[1]

[1]However, as indicated in Section 2.2, the Census Construction (continued)

This, together with the absence of any spatial detail on PWI, imposes limits on the usefulness of the BEA data in a comprehensive functional and regional analysis of PWI.

c. Missing Linkage Between Governmental Revenues and PWI -- Like the Governments Division data, the BEA estimates of governmental revenues are linked to government expenditure in general and do not specifically identify the financing mechanisms used by government to fund PWI. Moreover, the revenue estimates are national totals as are most of the data published by BEA.

d. Exclusion of Land Purchases -- Although the Census Construction Division data which BEA utilizes to estimate public works construction outlays include land preparation costs and architectural engineering fees, the data do not explicitly reflect the cost of purchasing land. Consequently, to the extent the seller of the land resides in the same region as the public construction project, any use of the BEA data to analyze the effects of PWI on regional incomes would tend to overstate the importance of PWI as an income generating (or economic development) mechanism.

e. Use of Obligations to Measure Federal Equipment PWI -- By using the object class data in the Treasury Bulletin the BEA estimates of Federal non-military equipment reflect obligations rather than actual expenditures. As indicated previously, this presents a consistency problem (primarily with regard to the timing of the investment) with other PWI data expressed as actual outlays.

3.3 Federal Information Exchange System

3.3.1 Strengths

a. Data Are Centrally Compiled -- Like the Governments Division and BEA data, use of the FIXS offers the advantage of being an "off-the-shelf" source.

(continued)
Division value put-in-place data which underlie the BEA estimates, do distinguish Federal construction from state and local construction. Moreover, unpublished BEA data provide significant functional detail at the national level on each type of state and local government PWI.

b. Consistent with OMB Reporting Procedures -- The Federal agencies reporting to the Community Services Administration use OMB Circular No. 84 as a guide in the reporting process. Consequently, all data in the FIXS is theoretically consistent with standard OMB definitions and classifications. Moreover, OMB requires all data that are reported to the CSA to be reconciled with the budget outlays reported to OMB. Consequently, there is at least some centrally devised methodology for reporting expenditure data, although, as is discussed in Section 3.3.2.c, the methodology is not always followed.

c. Conducive to Parameter Analysis -- The most significant feature of the FIXS is that it is the only known centralized data base available containing detailed estimates of Federal expenditures. Use of the FIXS allows analysis of Federal funds by function, location, type of assistance (i.e., grants, loans, procurement, etc.) and agency. Of these parameters, the most important is location. As noted above, neither the Governments Division nor BEA data series contained spatial detail on Federal expenditures. The FIXS, on the other hand, offers detail on the geographic distribution of Federal funds down to the county and city level.

3.3.2 Weaknesses

a. Federal Obligation Data Only -- The FIXS data base consists of only those outlays made by the Federal government. Moreover, outlays are measured in terms of obligations incurred rather than actual expenditures, and only those obligations incurred by the executive branch of the Federal government are measured.

b. PWI Not Separately Identified -- Obligations in the FIXS are listed by OMB appropriation account which include both capital and operating funds. Consequently, any analysis of PWI using the FIXS must be restricted to only those appropriation accounts designed for investment purposes. The funds contained within these accounts were earmarked by Congress primarily for PWI and are "captalized" by government accountants regardless of their use.[1]

[1]Thus, for example, all funds within the Federal Aviation Administration's Facilities and Equipment (Airport and Airways Trust Fund) Account are capitalized by FAA accountants, despite the use of some of the funds for Federal personnel compensation.

c. Absence of Quality Control Measures -- A fundamental deficiency with the FIXS is that there is no mechanism for verifying the data submitted by the Federal agencies. The CSA acts only as a manager of the data system, and has no means of assuring that the data provided by the agencies conform to the guidelines set forth in OMB Circular No. 84. In our use of the FIXS data for this study, we came across several instances where the problem was apparent. First, some Federal expenditure programs or appropriation accounts were not reported. Since our analysis focused on only a subset of all Federal expenditure programs, we could not ascertain the extent of this under-reporting. However, it has been noticed by others who have worked with the data.[1] Secondly, there appears to be no consistency among the agencies in the assignment of the type of assistance codes used to describe the outlays. For the appropriation accounts we examined, we found some Federal agencies reporting the entire obligation amount as procurements, while others (most notably the Bureau of Reclamation) would split the obligation into procurements and wages and salaries. Even more puzzling was the reporting of some obligations as entirely salaries and wages, though (as noted above) the programs we focused on were strictly related to the construction of facilities or purchase of equipment. Thus, one would expect the type of assistance to be entirely procurement, unless the account included some loans, grants, or employee compensation, in which case the agency may rightfully have separated the account into more than one type of assistance code. However, it is difficult to conceive why an entire obligation amount for a construction program would be classified as salaries and wages. The ramifications of these inconsistencies are uncertain. However, it appears that any analysis of the FIXS data using the type of assistance codes should be undertaken with caution. Finally, a third problem encountered with FIXS related to quality control concerns the handling of allocations from one agency to another. In the Budget Appendix these allocations show up in the "parent account" (i.e., appropriation account of agency which is making the transfer). According to CSA, however, in the FIXS the opposite is true. That is, all allocations show up under the agency receiving the allocation. What we found, however, is that this is true

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[1] See, for example, Thomas J. Anton, "Outlays Data and The Analysis of Federal Policy Impact", paper prepared for the Urban Impacts of Federal Policies Conference, Washington, D.C., February 8-9, 1979.

only some of the time. For example, in 1977 the allocation from the Bureau of Prisons buildings and facilities account to the General Services Administration was included under both the BOP and GSA in the FIXS data, leading to a double counting of obligations. On the other hand, for the Social Security Administration's limitation on construction, the FIXS data reported an apparent transfer from SSA to GSA under the GSA obligations, but reported no obligations under the parent account. Examination of the Budget Appendix, however, found the opposite; in other words, obligations under the parent account but no transfer to GSA. Moreover, the total obligation amount in the Budget Appendix was more than four times that of the FIXS data, indicating undercoverage in the FIXS. Thus, in our use of the FIXS data, we uncovered inconsistencies in the treatment of allocations from one agency to another, leading to instances of both over and undercoverage.

d. Measurement in Current Dollars and on a Fiscal Year Basis -- The shortcomings were discussed earlier in Section 3.1.2. The reader may refer to that section.

e. Reliability of Data Below State Level -- Much of the data in the FIXS is distributed below the state level using statistical proration techniques. The methodological structure of these techniques varies widely, and has been criticized by several users of the FIXS data.[1] However, since the spatial analyses of the FIXS data in this study did not extend below the state level, this did not present a problem.

f. Changes in Functional Classification Over Time -- Since 1968 when the FIXS began, the functional classification scheme used by CSA has changed three times. Consequently, comparison of functional expenditures across years may be misleading since the functional groups will not consist of the same set of appropriation accounts or programs.

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[1]See Thomas J. Anton, "Outlays Data and the Analysis of Federal Policy Impact", a paper prepared for the Urban Impacts of Federal Policies Conference, Washington, D.C., February 8-9, 1979; Congressional Budget Office, Troubled Local Economies and the Distribution of Federal Dollars, Washington, D.C., U.S. GPO, 1977; Fred Hines and J. Norman Reid, Using Federal Outlays to Measure Program Equity -- Opportunities and Limitations, Working Paper No. 7711, Washington, D.C., 1977.

3.4 Independent Surveys

Although two different types of independent surveys were utilized in the study, their strengths and weaknesses are similar enough that they can be evaluated together.

3.4.1 Strengths

a. Precision Control Over Data Collection and Management -- By collecting data through a direct survey, one gains the advantage of being able to exercise greater control over the data which are gathered. Thus, even though the PWI data collected for this study through the use of surveys were initially collected by others, we could more selectively control the parts of that data used in this study. As a result, the survey data are considered to be the most reliable PWI data in the study.

b. Specificity -- This is related to the first strength, since the greater data control allowed us to obtain the level of detail in the PWI data we desired. With regard to the onsite visits, this meant being able to distinguish between maintenance and renovation expenditures and new construction, and establishing a linkage between local governmental revenues and PWI expenditures. Similarly, for the mail/phone surveys, we were able to specifically request that the agencies provide the spatial and temporal detail which we sought.

3.4.2 Weaknesses

a. Limited Coverage -- The primary disadvantage of relying on surveys to collect data is that they require a large investment in human, monetary, and time resources. Since these resources are limited, there must eventually be some sacrifice in the comprehensiveness of the survey. For the onsite surveys, the sacrifice was a spatial one, as we were forced to limit our visit to nine cities. Similarly, for the mail/phone survey, we were not successful in contacting or receiving usable responses from the universe of Federal agencies. Consequently, the analysis of that data focused primarily on natural resources related public works investment.

b. Measurement in Current Dollars and on a Fiscal Year Basis -- Again, this is a common shortcoming of using agency data, and one which we addressed earlier.

c. Incompatibility Between Different Types of Outlays -- This is relevant to only the PWI data collected in the mail/phone surveys, and refers to the use of obligations, appropriations, net additions to physical plant, and prime contract award data to measure PWI outlays. The fundamental problem here is primarily a time dimension one due to the lag between project planning and completion. This was mitigated somewhat by analyzing the data on an average annual basis.

3.5 Comparability Between PWI Data Sources

In Section 3.1 through 3.4 we examined the individual strengths and weaknesses of each of the major PWI data sources utilized in the study. However, while those discussions provide valuable insight into the composition and quality of the PWI data sources individually, they do not address the question of "How do the PWI data sources compare as a group?". And this is an important question since the conclusions drawn in the study are based upon data drawn from more than one source.

To make a valid comparison it is important to focus on data purported to cover the same topic. Of the data sources used in the study, only the Census Governments Division and BEA data fit this qualification. These were the two most widely used sources in the study and, together with the Census Construction Division PWI data which are embodied in the BEA estimates, are the only comprehensive PWI data bases available. The FIXS data, and those data collected in the independent surveys, are of a limited nature -- focusing on a particular type of PWI. Consequently, the question of data comparability can best be answered by analyzing the BEA and Census Governments Division PWI data.

3.5.1 Comparative Analysis of BEA and Census Governments Division PWI

As indicated in Chapter 2.0, both the BEA and the Census Governments Division compile PWI data for all levels of government. To determine the extent to which the BEA and Census data series resemble one another, a temporal comparison of the series was made for national construction and equipment outlays (see Exhibit 3.2).[1] To make a meaningful comparison, the Census Governments Division data were first put on a calendar year basis by CONSAD using a simple conversion procedure:[2]

[1] These are the two largest components of PWI. The other component consists of land and gross purchases of existing structures in the Census Governments Division data, and net purchases of existing structures in the BEA data.

[2] For 1977, the Census Governments Division data represent FY 1977 because FY 1978 data were not available.

Exhibit 3.2: Comparison of Census and BEA Construction and Equipment Expenditures, By Level of Government (in millions of dollars)

Capital Outlays	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
Construction[1]											
BEA	14059	15457	16070	15863	17148	17869	19357	20383	22062	24007	25328
Census	14353	15689	16143	16410	17107	17731	18828	20154	21649	23200	24380
Federal[2]											
BEA	2974	3387	3724	3622	3879	3913	4001	3898	4014	3964	3267
Census	3307	3440	3571	3627	3723	3713	3892	4252	4541	4540	4221
State											
BEA	NA	NA	5799	5137	5966	6316	7253	7633	8030	9165	9776
Census	4670	5480	5723	5604	5830	6339	6990	7386	7898	8919	9802
Local											
BEA	NA	NA	6547	7104	7303	7640	8103	8852	10018	10878	12285
Census	6376	6769	6849	7179	7554	7679	7946	8516	9210	9741	10357
Equipment [1]											
BEA	25311	13677	13494	10884	13634	14031	13820	13364	12782	13904	15642
Census	14200	14368	14269	13901	14534	15720	15187	12082	11791	14361	16728
Federal[2]											
BEA	11241	12286	12357	9612	12321	12637	12244	11579	10864	11775	13375
Census	13172	13317	13135	12684	13245	14307	13692	10506	10047	12327	15493
State											
BEA	NA	NA	303	331	357	388	428	494	558	629	760
Census	261	277	289	315	343	372	409	478	539	613	725
Local											
BEA	NA	NA	834	940	956	1005	1147	1292	1360	1500	1507
Census	767	774	845	902	946	1041	1086	1098	1205	1421	1483

NA = Data not available. Prior to 1959, separate estimates of state and local geographical formation are not available in the BEA Series.

[1]Values may not sum to total due to rounding.

[2]Includes military and non-military outlays.

Exhibit 3.2: Comparison of Census and BEA Construction and Equipment Expenditures, By Level of Government (in millions of dollars) (continued)

Capital Outlays	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Construction[1]										
BEA	27605	27963	28096	29870	30399	32982	39326	41005	38338	37842
Census	25805	27624	29732	31980	32893	34264	39237	44089	44407	43588
Federal[2]										
BEA	3367	3312	3290	3982	4307	4853	5581	6439	6778	7402
Census	3952	4041	4116	4441	4717	4871	5857	6765	7177	7429
State										
BEA	10219	10954	11906	12588	14097	13503	14643	14322	12605	11533
Census	10332	10898	11816	12734	12675	12491	13549	14863	14545	13804
Local										
BEA	14019	13697	12900	13300	12995	14626	19102	20244	18955	18907
Census	11521	12685	13800	14805	15501	16902	19897	22460	22685	22355
Equipment[1]										
BEA	15784	15074	17013	15188	16622	15047	13585	17961	20440	22177
Census	17823	16345	14776	15473	17833	17175	17714	20410	23931	25857
Federal[2]										
BEA	13292	12944	13982	11890	12925	10872	8580	12422	14547	15835
Census	15492	13783	11910	12438	14406	13211	13067	15171	18440	20251
State										
BEA	814	854	915	941	.1001	1172	1383	1512	1627	1816
Census	778	828	868	879	960	1125	1306	1420	1464	1477
Local										
BEA	1678	1906	2116	2357	2696	3003	3623	4027	4266	4526
Census	1552	1734	1998	2162	2467	2839	3341	3819	4027	4129

NA = Data not available. Prior to 1959, separate estimates of state and local geographical formation are not available in the BEA Series.

[1]Values may not sum to total due to rounding.

[2]Includes military and non-military outlays.

$$C_t = .5\left(F_t + F_{t+1}\right), \text{ where}$$

C_t = Capital outlay on a calendar year basis in year 't'

F_t = Capital outlay in fiscal year 't'

F_{t+1} = Capital outlay in the following year.

A statistical analysis of this comparison produced the following results:

Expenditure	Mean Percentage Difference[1]	Standard Deviation of Mean Percentage Difference
Total Construction	4.3	4.22
Federal	9.4	8.36
State	4.5	5.31
Local	9.5	6.52
Total Equipment	11.5	7.02
Federal	15.9	11.49
State	5.4	3.59
Local	6.2	3.43

As the comparative statistics indicate, the largest divergence between the two data series occurs for Federal PWI. This is true for both construction and equipment purchases. For equipment purchases, both the mean percentage difference and standard deviation are large, indicative of noticeable fluctuations in the relative difference between the BEA and Census Federal equipment series over time.[2] This difference is particularly noticeable from 1972 to 1977. Although the precise cause of this difference is not known, BEA and Census do utilize different procedures for estimating Federal PWI, both in construction and equipment, and this may account for some of the variance.[3] The same is true for

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[1] The BEA data were utilized as the base units in these computations.

[2] This is supported by confidence interval estimation procedures, which show that there is a 95 percent probability that the mean percentage difference between BEA and Census Federal equipment outlays is between 11 and 20.8 percent.

[3] A further discussion of this variation is provided in Section 3.5.2 below.

for state and local construction expenditures, where BEA in recent years has utilized the F.W. Dodge data, while Census has relied on state government records and local government samples. However, the divergence between the BEA and Census series for state and local equipment purchases (though stable over time) is somewhat puzzling, since sources at BEA indicate that their state and local estimates are essentially those reported by Census adjusted to a calendar year reporting basis -- a procedure which we have performed here.

3.5.2 Analysis of Variance in Federal PWI

Due to the sizable variation between the BEA and Governments Division PWI data at the Federal level, a separate analysis was performed on the Federal expenditure component of PWI. Military investment was excluded from this analysis since the PWI study itself focused primarily on non-defense Federal investment, and we wished to determine how much of the total variance was caused by non-defense Federal investment (hereafter simply referred to as Federal PWI). To gain this insight a time trend analysis of the variation between BEA and Census Federal PWI was performed. The results of this analysis are shown in Exhibit 3.3. The two data series exhibit similarity in their growth/decline pattern only during 1960-1964 period. In all other years noticeable deviations are present -- especially from 1968 through the present. In addition, the expenditure size ranking is roughly equal between the two series: over the 21 year period for which the analysis was performed the Census PWI estimates were larger than the BEA estimates in 11 years, with the BEA estimates being larger in the remaining 10 years. In general, the BEA estimates were larger in the earlier years, and Census estimates larger in the later years, although the trend lines of the two series cross paths at three time intervals. The last crossing of time paths occurs between 1967 and 1968, at which time the difference between the two series begins to become increasingly larger. For the period as a whole, the percentage difference between the BEA and Census Federal PWI estimates averaged about 23 percent -- indicative of the sizable variations between the two data series. Moreover, the standard deviation of the annual percentage differences approached 19 percent, indicating that the relative difference between the two data series has not been constant, but has widely fluctuated over the study period. Finally, the low correlation coefficient of .54 provides further evidence of the incongruity between the two data series.

3.5.2.1 Significance of Variations

While the differences between the Census and BEA Federal PWI estimates appear to be quite sizable for the 21 year historical period, they are not large enough to affect the results of a macroeconomic analysis of Federal PWI. Verification of this is shown in Exhibit 3.4 which shows a comparison of Federal PWI relative to GNP using the Census and BEA estimates. As the trend analysis indicates, because Federal PWI

Exhibit 3.3: Comparison of Trends in Federal PWI Using BEA and Census Data

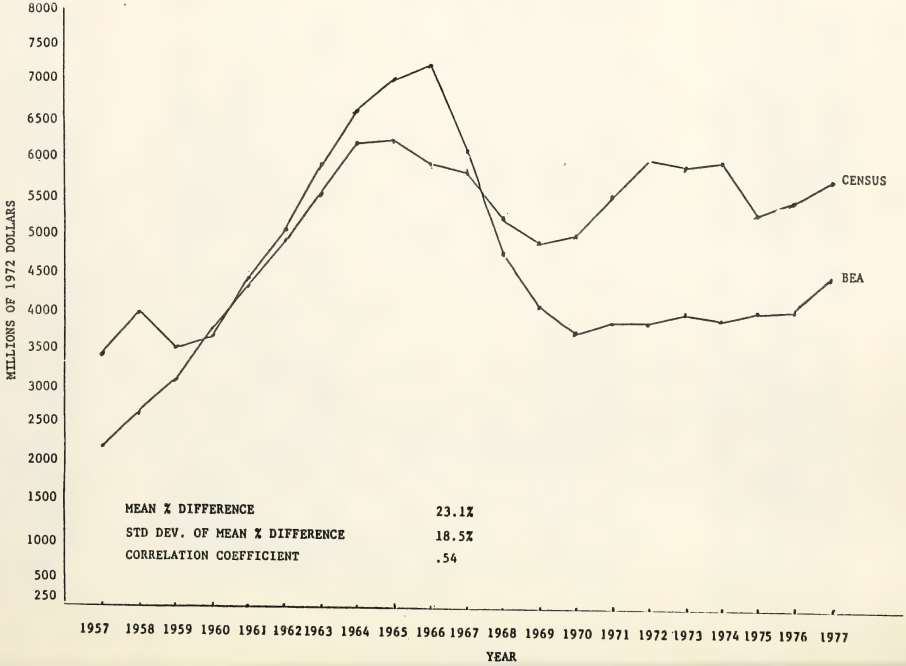
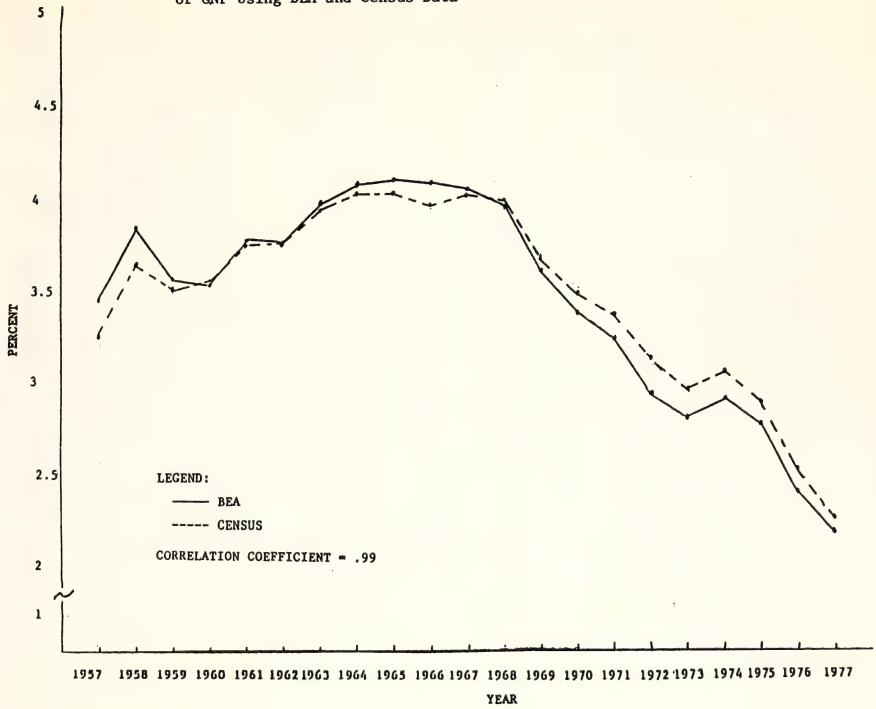


Exhibit 3.4: Comparison of Trends in Federal PWI as a Percentage of GNP Using BEA and Census Data



contributes such a small portion to total PWI and GNP, its absolute size can vary sizably with no appreciable impact on an analysis of national aggregates. However, the effect upon the functional distribution could conceivably be much larger by the use of one series versus the other. Unfortunately, because there is little similarity or functional detail between the two series it is not possible to determine for certain if any one type of functional expenditure was responsible for the variance between the two data series, or if the differences were spread about evenly across all functional expenditures. However, as explained below, it appears that the divergence between the Census and BEA estimates can be attributed more to definitional inconsistencies and the use of different primary data sources than to a singular causative factor.

3.5.2.2 Explanatory Factors Underlying Variation

To obtain some insight into the underlying reasons for the differences between the BEA and Census Federal PWI estimates, the total outlays for each series were separated into two expenditure components:

(1) Construction
(2) Equipment, and land and existing structure purchases.[1]

The outlays for each of the components were then plotted (see Exhibits 3.5 and 3.6) and temporally analyzed. As Exhibit 3.5 shows, the construction outlays of the two series correlate quite closely throughout the 21 period, with most of the variation due to differences in Federal agency coverage and the original data sources used by the Census Governments and Census Construction Divisions.[2] For the equipment, and

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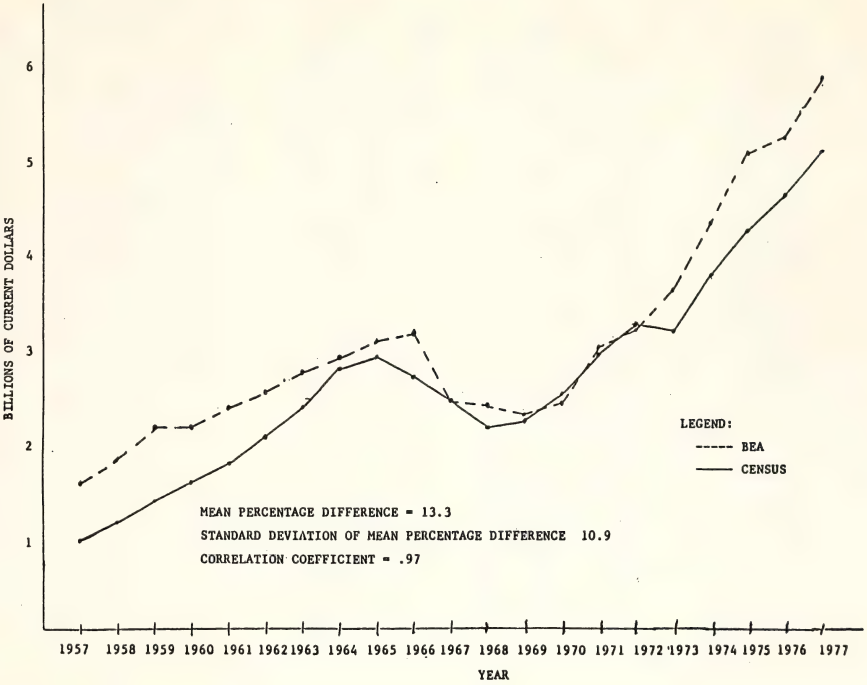
[1]The inability to separately identify equipment purchases from purchase of land and existing structures in the Census data prevented these two components from being analyzed individually.

[2]For Federal agencies with construction expenditures greater than $15 million annually, the Census Construction Division obtains its estimates directly from each agency. For agencies with less than $15 million in construction, expenditure information is obtained from the Fiscal Year Outlays shown in the Federal budget. A total of 40 agencies are covered, with coverage estimated at 95 percent of all Federal construction put-in-place. The Census Governments Division, on the other hand, collects most of its information from the Budget Special Analyses, with the exception of TVA which provides information directly, and several smaller agencies where the Budget Appendix is used.

Exhibit 3.5: Federal Outlays for Non-Defense Construction as Reported By Census Governments Division and BEA



land and existing structures component, however, the two data series differ substantially (see Exhibit 3.6). Consequently, it is this component of Federal PWI which appears to be the source of the wide discrepancies between the two series. Further research into these expenditures revealed that two general factors underlie these variations:

(1) Differences in definition of expenditure types.
(2) Use of different primary data sources.

With regard to definitional differences, the BEA data does not include purchases of land whereas the Census data does. In addition, estimates of purchases of existing structures in the Census data are gross outlays, while the BEA defines such purchase to be net of Federal sales.[1] Again, just how important these factors are cannot be determined because the Census Governments Division does not separate non-defense equipment, and land and existing structure purchases in their published data. Nevertheless, the trends shown in Exhibit 3.6 imply that net purchases of existing structures were negative during the 1970's; that is, the Federal government sold off a greater value of property than it purchased.

The other important factor underlying the divergence of the time trends shown in Exhibit 3.6 is the use of different primary source data by the BEA and Census for their equipment estimates. The BEA uses the Treasury object class data published in the Treasury Bulletin as the initial basis for their estimates and then applies a statistical adjusting procedure. The Census Governments Division, on the other hand, uses equipment data published under object class code 31 in the Budget Appendix.[2] Both sets of data are obligations rather than actual expenditures, and according to sources within each agency, are not very reliable.

3.5.2.3 Summary

In summary, the above analyses show that the BEA and Governments Division PWI data in general, and Federal investment in particular, do not compare well over the 1957-1977 historical period. Moreover, these differences are not confined to the military sector, as was initially believed, but are characteristic of non-defense public investments as well. However, other than the observation that the variance is larger for equipment purchases than construction, the difference between the two series does not appear to be attributable to a single factor or subset of data. Instead, the problem seems to be a methodological one, caused by the use of several different data sources. This brings to the forefront the problem of having

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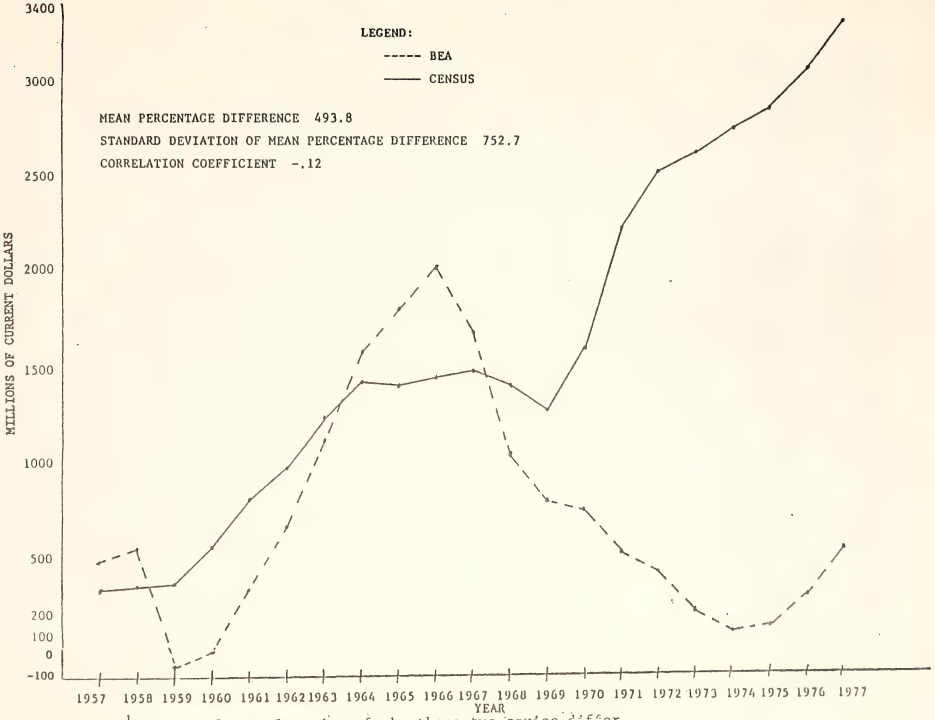
[1] In fact, for all the years examined in the analysis, BEA net purchases of existing structures were always negative or zero.

[2] As in the construction component, an exception is for TVA equipment purchases which are obtained directly from TVA.

Exhibit 3.6: Federal Outlays for Non-Defense Equipment and Land and Existing Structures Purchased by Census Governments Division and BEA[1]



[1]See text for explanation of why these two series differ.

more than one group responsible for collecting similar data. This suggests a need to integrate the collection of PWI and related data within the Federal government. By integrating the data collection responsibilities of such organizations as the Census Governments and Construction Division, and BEA, the duplication and inconsistencies so common to the present data processing network would be reduced. Such a coordination of effort would contribute towards improving the quality of data on public works investment outlays, and thus increase the information to be gained from analyzing the data. This is the subject of the next chapter.

4.0 RECOMMENDATIONS FOR IMPROVING THE QUALITY OF PWI DATA

At the end of the last section we indicated there exists a need to improve the quality of the public works investment data presently being collected. There, we recommended that one way to improve the data would be to centralize the data collection process by integrating the operations of those agencies and divisions within the Federal government which presently collect PWI information. In addition, there are two other recommendations whose implementation we feel would be advantageous:

(1) The design of a comprehensive methodology for the collection of PWI data; and

(2) Convertibility of all hard copy data into automated form.

Each of these recommendations are discussed in detail below.

4.1 Centralization of the Data Collection Process

Essentially, there are three principal divisions within the Federal government which collect PWI-related data -- all part of the Department of Commerce. They are the Census Governments Division, the Census Construction Division, and the Bureau of Economic Analysis. As part of the largest data collecting organization (i.e., the Bureau of the Census) in the Federal government, the Governments and Constructions Divisions are the most important of the three. These two divisions can be distinguished from the BEA on the basis of data collection methodology. Whereas the BEA compiles its PWI data series from already centralized data bases,[1] the Governments and Construction Divisions develop their PWI data series by collecting information from a number of dispersed sources. Consequently, a considerable amount of duplication of effort in the collection of PWI data exists within the Bureau of the Census alone. And this is compounded by the existence of a third set of estimates (though defined differently) published by the BEA. Thus, as can be seen, there is sufficient overlap between the three PWI series to generate uncertainty among data users regarding which data series most accurately reflects government investment. This is clearly an undesirable situation.

It is likely that the reason behind this duplicative effort lies in the ultimate goals and organizational functions of the three groups. If

[1] For example, BEA estimates of governmental construction and equipment purchases are derived from data compiled by the Census Construction Division, and Treasury and Defense Departments, respectively.

this is so then it is easy to understand how and why more than one PWI series is being produced, and that perhaps one solution would be to better integrate each group's goals and responsibilities. Of course, this may not be administratively feasible. In any case, it should be recognized that, at least in the area of public works investment, there is a need for more closely integrating the data collection and estimation activities of the Census Governments and Construction Division, and the BEA. There should be greater coordination among the three groups, with a concerted effort towards producing a compatible data series on PWI. By bringing together knowledgeable sources within each of the three groups, and incorporating the most important strengths of the present three data series, a large contribution would be made towards understanding the economic importance of PWI.

4.2 Design of a Comprehensive Methodology For the Collection of PWI Data

One of the major weaknesses found in working with the PWI data was that the various governmental groups collecting or compiling the data did not have any real means for controlling the quality of the data. The quality of some of the data used by the government groups to derive PWI estimates, whether the data was obtained from secondary or primary sources, was essentially not verifiable. Moreover, the completeness of the data and the level of detail available was dependent upon who originally collected the data. Consequently, many of the questions we sought to answer regarding the spatial and functional distribution of PWI, and the relationships between PWI and revenue mechanisms could only be partially addressed and, in some instances, case studies proved to be the only viable way of collecting the data, a rather costly approach. To correct this deficiency, we feel that in addition to achieving greater coordination among the three primary producers of PWI estimates,[1] a detailed and comprehensive methodology for the collection of PWI data should be designed and implemented. This is not to say that the entire PWI data collection process which is presently used by Census and BEA needs to be restructured. Many of the present techniques are quite comprehensive and should continue to be used. This is particularly true of the use of the F.W. Dodge data by the Census Construction Division to estimate state and local construction. However, there is a need to develop a consistent PWI terminology and set of definitions which can be incorporated by both Census and BEA into the data collection process. As indicated previously, in some cases the procedures presently being used by Census and BEA to collect PWI data are quite adequate and could continue to be used (perhaps

[1] In other words, the Census Governments and Construction Divisions, and the Bureau of Economic Analysis.

with a greater emphasis on obtaining additional spatial and functional detail). Yet, in other areas, major revisions to existing procedures, or entirely new collection methodologies, are required. This is particularly true with regard to the linking of PWI to governmental financing, expenditures by function, separation of data on maintenance, and in the collection of data on public works investment by the Federal government.[1] There is insufficient detail in the present Census and BEA PWI data series, and much of this can be attributable to Census' and BEA's reliance on data generated by others (i.e., state, local, and other Federal governmental agencies) whose primary interest is not in PWI. Consequently, there is a need to devise a PWI data collection methodology which will not only make the PWI series developed by Census and BEA mutually consistent, but which will provide a guiding hand for those other governmental units collecting data that is eventually used by Census and BEA to develop a PWI series.

4.3 Automation of PWI Data

This recommendation refers to possessing a capability to convert all hard copy PWI data into automated form -- i.e., to place the data on magnetic tape, disc, or other data storage devices. Thus, unlike the previous two recommendations, this recommendation has nothing to do with PWI data characteristics or content. Instead, it is concerned with data management.

The primary advantage of automating PWI data is that is makes the data easily accessible and conducive to analysis. And this is an important capability when one is working with a data base as large and detailed as the one we foresee possible. Obviously, there are attendant human and capital (monetary) costs involved in maintaining an automated data base. However, from our experience with the collection and analysis of PWI data in this study, we have found that without the implementation of an automated data system, it would be technically infeasible to perform all of the analyses required in a detailed assessment of PWI.

[1] A major step forward in this latter area has been made with the establishment of the Federal Procurement Data System -- an automated central government system to keep track of Federal contracts. The system was established under the Federal Procurement Policy Act, Public Law 93-400, which created the Office of Federal Procurement to "establish a system for collecting,developing, and disseminating procurement data which takes into account the needs of the Congress, the Executive Branch, and the private sector". Each Federal agency reports procurement data to the Federal Procurement Data Center which is managed by the Department of Defense. The primary advantage of the system is that it will provide a significant amount of spatial and functional detail on obligations incurred by the Federal government.

5.0 SUMMARY AND CONCLUSIONS

In the previous chapters, the major PWI data bases utilized to assess public works investments over the past two decades were examined. Each source was evaluated for its contents, strengths, and weaknesses, and a set of recommendations made on how the data could be best improved. What we found from all of this research is that at present there exist sizable and fairly detailed PWI data series available for analysis. Most of the data is produced by the Bureau of the Census and the Bureau of Economic Analysis and is readily available in publications which they publish frequently. Yet, we also have found this data to be insufficient to address all questions regarding the functional and spatial distribution of PWI, and its linkage to various financing mechanisms. Consequently, we have suggested three recommendations which would improve the data available on public works investment, and concomitantly increase our awareness of PWI.

First, greater cooperation and integration between the Bureau of the Census and the Bureau of Economic Analysis is needed in the PWI data collection process and publishing of PWI estimates. Secondly, as part of centralizing the PWI data collection and estimation process, a comprehensive PWI data collection methodology should be designed which will increase the quality and consistency of PWI data by clearly delineating to other Federal, state, and local governmental units which in many cases collect the primary PWI data, what "kinds" of PWI data are actually desired. Finally, all PWI data collected should be automated. The first two of these recommendations relate to increasing the quality or comprehensiveness of PWI related data. The third facilitates its use in statistical analyses.

In closing, we are well aware that the recommendations which we have proposed are quite broad and do not suggest precisely how they should be implemented. Such detail we feel could best be dealt with by the Bureaus of the Census and Economic Analysis which are most familiar with the PWI data collection process. Moreover, it is recognized that implementation of these recommendations will not be easy. Such constraints or obstacles are understandable since PWI data is only one subset of the information collected by the United States Government. What is important to understand, however, and what we have sought to convey, is that the present PWI data series are characterized by certain structural weaknesses which serve to cast a shadow on its quality and limit the comprehensiveness with which they can be analyzed.

APPENDIX B: DERIVATION OF CONSTANT DOLLAR PWI DATA AND SOCIOECONOMIC VARIABLES FOR REGIONAL ANALYSIS

TABLE OF CONTENTS

	Page
LIST OF EXHIBITS	B.iii
1.0 DATA SOURCES	B.1
1.1 Expenditure by Level of Government	B.1
1.1.1 Capital Outlays by State and Local Governments (PWI or Public Works Investment)	B.1
1.1.2 Direct General Expenditure by State and Local Governments	B.2
1.1.3 Federal Grants-In-Aid To States and Localties	B.4
1.1.4 Other Government Financial Variables	B.4
1.2 Socioeconomic Data	B.4
1.2.1 Population	B.4
1.2.2 Income and Earnings	B.4
1.2.3 Value Added by Manufacture, Payroll of Manufacturing Establishments and New Capital Investment in Manufacturing	B.5
1.2.4 Employment Data	B.5
1.3 Deflators	B.6
1.3.1 National Level Cost Indexes	B.6
1.3.2 Regional Cost Indexes	B.7
2.0 METHODOLOGY	B.10
2.1 Defining the Region	B.10
2.2 Calendar Year Versus Fiscal Year Data	B.10
2.3 Procedures for Conversion to Constant Dollars	B.12
2.3.1 Derivation of Constant-Dollar State and Local (Combined) PWI	B.12
2.3.2 Derivation of Constant-Dollar State Government PWI and Local Government PWI	B.17
2.3.3 Procedure to Derive Personal Income in Constant Dollars	B.19

LIST OF EXHIBITS

Exhibit Number		Page
1.1	Availability and Characteristics of Capital Outlays Data, By Function and Level of Government	B.3
2.1	Census Regions	B.11
2.2	Mapping of BEA Implicit Deflators to Census Current-Dollar Functional Categories, State Government PWI	B.14

1.0 DATA SOURCES

1.1 Expenditure by Level of Government

1.1.1 Capital Outlays by State and Local Governments (PWI or Public Works Investment)

All data on capital outlays by state and/or local governments contained in this study have been taken from annual publications of the Governments Division, U.S. Bureau of the Census; Governmental Finances in (Year) and State Government Finances in (Year) were the main sources of such data. Data presented in these two publications allowed us to identify the following functional categories of capital investment by level of government:

State and Local Governments

Total Capital Outlays
- Education
- Highways
- Health and Hospitals
- Sewers and Sewage Disposal
- Utilities
  - Water Supply Systems
  - All Other Utilities

Local Governments

Total Capital Outlays
- Education
- Highways
- Health and Hospitals
- Sewers and Sewage Disposal
- Utilities
  - Water Supply Systems
  - All Other Utilities

State Governments

Total Capital Outlays
- Education
- Highways
- Health and Hospitals
- Natural Resources
- General Public Buildings
- Miscellaneous Commercial Activities
- Public Welfare
- Correction
- Water Transport and Terminals
- Liquor Stores

However, not all categories are available for all years within the purview of this study. Exhibit 1.1 summarizes the availability of these data by function and by level of government.

All annual data from these Bureau of the Census publications are based on fiscal year. As noted in Exhibit 1.1, state and local government capital outlays for selected functions by state are available annually for the entire time period under study; however, detailed capital outlay data for local governments PWI by state were not broken out prior to 1961. Since total state and local government capital outlay by state was available, as well as state capital outlay by state, it was possible to derive total local government capital outlay by state as a residual; it was not possible, however, to do this for every functional category. The series on local government PWI by state for sewers and sewage disposal could be extended back to 1957 from the state and local government PWI data based on the knowledge that all expenditures on this category were made by local governments.

The state government capital outlay series shows more functional detail than the state and local, or local government PWI series. The functional categories shown represent the maximum number which cover the entire time period in question.[1] Other functions which may have been broken out at various points in time have been absorbed into the "All Other" category. Moreover, certain regions or states may not show any capital expenditures in certain categories in several or all years due to political, topographical or other peculiarities of individual states; salient examples of such categories are Liquor Stores, Miscellaneous Commercial Activities and water Transport and Terminals. Still other categories may show enormous shifts over time among states or regions; for example, the Miscellaneous Commercial Activities category exhibits extreme changes in the level of capital expenditure both temporally and interregionally.

1.1.2 Direct General Expenditure by State and Local Governments

Direct general expenditures are defined to be all expenditures (by a governmental unit) other than intergovernmental expenditures for all categories except utility expenditure, liquor stores expenditures and insurance-trust expenditures. These data area available by state (with the exception of Alaska in 1958 and Hawaii in 1958 and 1959) for 1957-1959 and 1961-1977. The analyses using these data were performed for the time period 1961-1977 only. The source of these expenditure data was Governmental Finances in (Year) published by the U.S. Bureau of the Census.

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[1] One exception to this is the category "Water Transport and Terminals", for which no capital outlay data were shown in 1964. While capital expenditures for "Health and Hospitals" were available for the entire period, "Health" as a separate category was not available in 1960.

Exhibit 1.1: Availability and Characteristics of Capital Outlays Data, By Function and Level of Government

Functional Category	State & Local Years Available	Local Years Available	State Years Available
Capital Outlays, All Functions	FY1957-1977[1]	FY1957-1977[1]	FY1957-1977
Education	FY1957-1977[1]	FY1957-1977	FY1957-1977
Highways	FY1957-1977[1]	FY1961-1977	FY1957-1977
Health & Hospitals	FY1957-1977[1,2]	FY1961-1977	FY1960[3]
Sewers & Sewage Disposal	FY1957-1977[1]	FY1957-1977	
Utilities • Water Supply • Other Utilities	FY1961-1977[1]	FY1961-1977	
Natural Resources			FY1957-1977
General Public Buildings			FY1957-1977
Miscellaneous Commercial			FY1957-1977
Public Welfare			FY1957-1977
Corrections			FY1957-1977
Water Transport and Terminals			FY1957-1963; FY1965-1977
Liquor Stores			FY1957-1977

[1] Data for Alaska and Hawaii not available in 1958; Hawaii data not available in 1959.

[2] FY 1957-FY1960 data are for "Hospitals" only.

[3] Data for "Hospitals" only.

1.1.3 Federal Grants-In-Aid To States and Localities

These data items were obtained from the Bureau of the Census publication Governmental Finances in (Year) and has been obtained by state annually for 1957-1977. These data are referred to in this publication as "intergovernmental revenue from the Federal government" and are on a fiscal year basis.

1.1.4 Other Government Financial Variables

"Total Own Source Revenue" and "Indebtedness" of state and local governments are included in several of the analyses presented in Volume I, Chapter 4.0. Both data series have beem compiled from Governmental Finances in (Year) and are available annually for the period 1957-1977, on a fiscal year basis.

1.2 Socioeconomic Data

1.2.1 Population

Data on total population by state as well as population by age groups[1] were obtained from the U.S. Bureau of the Census P-25 series, "Current Population Reports". Total population by state was available for 1957-1977; state population by age group, however, was not available for 1959, and those obtainable for 1969 were provisional estimates which were not subsequently revised. These data on population by state were used in all calculations of per capita values.

1.2.2 Income and Earnings

Estimates of personal income by place of residence (hereafter referred to as simply "income") and income by place of work ("earnings") by state were obtained from unpublished data of the Bureau of Economic Analysis, Regional Economics Measurement Division. The figures shown therein represent the most recent revisions to the BEA data series entitled "Income by Industry, Including Earnings by Two-Digit SIC". "Earnings" is defined as the sum of wage and salary disbursements, other labor income (such as employers' contributions to private pension and welfare funds), and proprietors' income (both farm and non-farm). "Income" is then derived from earnings by subtracting personal contributions for social insurance by place of work, adjusting by a "residence factor" and adding dividends, interest, rent, and

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[1] Age groups are: less than 5 years, 5-17, 18-44, 45-64, and 65 and older; the 5-17 age group is referred to as "school-age population".

transfer payments.[1] These data are available annually on a calendar year basis, from 1958 to 1977.

1.2.3 Value Added By Manufacture, Payroll Of Manufacturing Establishments and New Capital Investment in Manufacturing

Data on value added, payroll, and new capital investment in manufacturing by state were obtained from the Annual Survey of Manufacturers or equinquennial Census of Manufactures, as appropriate. Value added by manufacture is obtained by subtracting the cost of materials, supplies, containers, fuel, purchased electric energy and contract work-from value of shipments for products manufactured plus receipts for services rendered. Value added per employee by manufacture was calculated by dividing value added by the number of persons employed in manufacturing. Since the 1977 Census of Manufactures has not, as of this writing, been published, data were available for 1957-1976 only.

1.2.4 Employment Data

The figures for manufacturing employment by state were obtained from the U.S. Department of Labor's Employment and Training Report of the President (previously Manpower Report of the President) for various years. These data are establishment-based statistics obtained from individual state's employment security agencies in cooperation with the U.S. Department of Labor.

The analyses, discussed in Volume I are based on data for the average annual number of employees (in thousands) on the payrolls of non-agricultural establishments by state for 1957-1977. These data are based on establishment records compiled by the BLS in cooperation with state agencies, designed to provide industry information on the number of wage and salary employees on payrolls of non-agricultural establishments. The data exclude proprietors, the self-employed, unpaid volunteer or family workers, farm workers and domestic workers in households.

Another employment series (total number of persons employed, by state[2]) was considered for this analysis but was rejected due to problems of historical discontinuity which could raise serious difficulties for time-series analysis.

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[1] For a more complete description of the derivation of state personal income, see "State Personal Income Revisions, 1971-1976", Survey of Current Business, August 1977, p. 15.

[2] See CONSAD Research Corporation, PWI Data Base: A Progress Report, prepared for the U.S. Department of Commerce, February 13, 1979, for a description of this employment series.

1.3 Deflators

This section provides a brief description of the deflators used to convert current dollar data to constant dollars. A more detailed account of the deflation methodology is presented in Section 2.3.

1.3.1 National Level Cost Indexes

Bureau of Economic Analysis. Implicit price deflators for state and local government PWI were derived from unpublished BEA data, "1959-1977 State and Local Government Purchases, in Current and Constant Dollars". Implicit deflators were calculated for total capital outlay and by functional category from data on aggregate state and local government capital expenditures for the following categories (the BEA tape shows expenditure in greater detail than shown below; many of the smaller categories have been eliminated or absorbed into larger categories):

BEA Functional Categories

All Functions
- General Control
- Financial Administration
- General Public Buildings
- Education
  - Libraries
- Health
- Hospitals
- Public Assistance and Relief
- Police
- Fire
- Correction
- Employment Security Administration
- Veterans Benefits and Services
- Protective Inspection and Regulation
- Highways
- Water
- Airports
- Miscellaneous Commercial Activities
- Liquor Stores
- Utilities and Sanitation
  - Transit
  - Gas Supply
  - Electricity
  - Water Supply
  - Sewerage
  - Sanitation
- Housing and Commercial Development
- Agriculture and Agricultural Resources
- Natural Resources
  - Natural Resources
  - Parks and Recreation
- Other

Other BEA Indexes. The implicit price deflator for Personal Consumption Expenditures, used for converting personal income in current dollars into constant dollars, was obtained, for 1957-1977, from the National Income and Product Accounts.

1.3.2 Regional Cost Indexes

The identification of "regional deflators" has been problematic since the inception of this study. There are no region-specific indicators of cost trends for either capital formation or general construction activity, nor of prices paid by consumers, of which we are aware. Yet some measure of regional price variations has been considered to be germane to the study of regional variations in PWI expenditure and their impacts. What we believe to be a thorough review of available local prices indexes has been presented in a previous report.[1] Several of these indexes were eliminated due to incompleteness, cost considerations or an inappropriate level of spatial detail. Those that remained are not considered to be optimal in any sense, but will yield what we believe to be reasonable indications of price variations across regions. The weaknesses of those indexes selected for use as price deflators have been acknowledged. Those indexes identified as relating to regional capital cost variations are defined for the construction component of capital investment only; all such indexes are based on cost conditions observed in a city or SMSA, rather than an entire state or region. We have assumed that interregional cost variations are reflected to a large extent by cost conditions in large cities within the respective regions. The development of regional deflators specific to large regions or states can be identified as an area where data weaknesses are serious and where a strong need for further research exists.

Engineering News-Record 20-Cities Index. (Source: McGraw-Hill, Inc., New York, New York). The Engineering News-Record (ENR) publishes two general indexes for 20 U.S. cities: the Construction Cost Index (CCI), which is composed of an unskilled labor and materials cost component constructed for cities, and represents changes in the cost of construction materials over time; and the Building Cost Index (BCI), which consists of the same materials cost index for each city as the Construction Cost Index but a labor component which represents the cost of skilled rather than unskilled labor. The Building Cost Index, Construction Cost Index, Materials Cost Index, Skilled Labor Index, and Common Labor Index are identified for the following cities (the Census region of each city is also noted):

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[1] CONSAD Research Corporation, Development of a PWI Data Base: Progress Report, prepared for the U.S. Department of Commerce, November 14, 1978.

City	Census Region	City	Census Region
Atlanta	5	Kansas City	4
Baltimore	5	Los Angeles	9
Birmingham	6	Minneapolis	4
Boston	1	New Orleans	7
Chicago	3	New York	2
Cincinnati	3	Philadelphia	2
Cleveland	3	Pittsburgh	2
Dallas	7	St. Louis	4
Denver	8	San Francisco	9
Detroit	3	Seattle	9

These indexes are available annually from 1957-1977.

These "deflators" have been used in this report as general indicators of regional price trends in construction activity for certain functional categories. The indexes were applied to categories based upon a knowledge (or assumption) of the relative amount of skilled versus unskilled labor employed in the construction activity of that functional category (See Chapter 3.0 for a detailed discussion of the use of these indexes as deflators).

U.S. Environmental Protection Agency Sewer and Sewage Treatment Plant Index. (Source: Environmental Protection Agency, Washington, D.C.). These indexes represent construction costs of EPA-assisted municipal sewers and sewage treatment plants based on labor and materials cost. The indexes are available monthly or quarterly (annual averages are also available) from 1957 to 1977 for the following 20 cities, with corresponding Census Regions noted:

City	Census Region	City	Census Region
Atlanta	5	Kansas City	4
Baltimore	5	Los Angeles	9
Birmingham	6	Minneapolis	4
Boston	1	New Orleans	7
Chicago	3	New York	2
Cincinnati	3	Philadelphia	2
Cleveland	3	Pittsburgh	2
Dallas	7	St. Louis	4
Denver	8	San Francisco	9
Detroit	3	Seattle	9

It should be noted that annual average indexes were not directly observable for 1957-1963, but the monthly index for August (the month of peak construction activity) was available for 1957 through 1976. Annual average indexes for both categories for all 20 cities were estimated (by means of simple regression) based on the relationship between the August value and the annual averages for 1964-1976.

Consumer Price Indexes for Selected Cities or SMSAs. (Source: Bureau of Labor Statistics, U.S. Department of Labor and Statistical Abstract of the United States, various years). This Consumer Price Index has been determined to be the only indicator of general regional price trends as they apply to personal income or earnings. These indexes are available for 1957-1977, with a few exceptions as noted, for the following cities/SMSAs:

City/SMSA	Census Region
Anchorage, AK (1960-1977)	9
Atlanta, GA	5
Baltimore, MD	5
Boston, MA	1
Buffalo, NY (1965-1977)	2
Chicago, IL - Northwestern, IN	3
Cincinnati, OH-KY	3-6
Cleveland, OH	3
Dallas, TX (1965-1977)	7
Denver, CO (1964-1977)	8
Detroit, MI	3
Honolulu, HI (1965-1977)	9
Houston, TX	7
Kansas City, MO-KS	4
Los Angeles, Long Beach, CA	9
Milwaukee, WI	3
Minneapolis-St. Paul, MN	4
New York, NY - Northeast, NJ	2
Philadelphia, PA-NJ	2
Pittsburgh, PA	2
Portland, OR	9
St. Louis, MO-IL	4-3
San Diego, CA (1965-1977)	9
San Francisco-Oakland, CA	9
Scranton, PA	2
Seattle, WA	9
Washington, D.C.-MD-VA	5

2.0 METHODOLOGY

2.1 Defining the Region

For the purposes of this study, the level of regional analysis has been defined to be the Census geographic division, which has been referred to throughout the study as the Census region. The mapping of states to Census Regions (see Exhibit 2.1) is as follows:

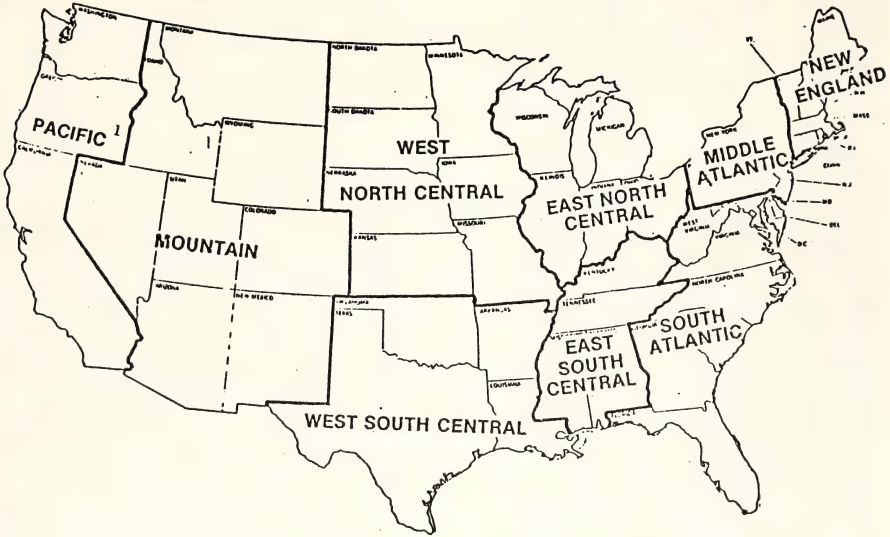
Census Region (Division)	State
New England	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
Middle Atlantic	New Jersey, New York, Pennsylvania
East North Central	Illinois, Indiana, Michigan, Ohio, Wisconsin
West North Central	Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota
South Atlantic	Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia
East South Central	Alabama, Kentucky, Mississippi, Tennessee
West South Central	Arkansas, Louisiana, Oklahoma, Texas
Mountain	Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming
Pacific	Alaska, California, Hawaii, Oregon, Washington

The selection of the Census region was based on the criteria of data availability, ease in aggregating state data to the regional level, and ease in comparing regional trends and impacts of PWI, with data presented in the public works literature.

2.2 Calendar Year Versus Fiscal Year Data

As previously noted, all annual data presented in the Bureau of the Census Governments Division publications are on a fiscal year basis, i.e.,

Exhibit 2.1: Census Regions



[1] Includes Alaska and Hawaii

financial statistics for a given year relate to governmental fiscal years which ended June 30 of that year or within the 12 previous months, with a few exceptions. This includes all data series on PWI (capital outlays by level of government), government direct expenditure, and government revenues including grants-in-aid.

Annual data on personal income and earnings, value added by manufacture, payroll and new capital investment in manufacturing and employment are based on a calendar year. Population data are shown "as of July 1" of that year for intercensal years, and "as of April 1" of the year in question for other Census years.

The different time frames for annual data may pose problems of comparability between data sets based on different accounting frameworks. As we noted, even the Census "fiscal year" data encompass several different definitions of the fiscal year and thus in any given year will include data which are not strictly comparable between states. No conversion of calendar-to-fiscal year (or vice versa) has been performed nor is it anticipated. It is believed that any errors introduced as a result are not serious ones to the extent that most of the analysis presented in this report relates to relative changes in variables interregionally and temporally.

2.3 Procedures for Conversion to Constant Dollars

Section 1.3 discussed in some detail the cost indexes used as the basis for deflating the current dollar data series to constant dollars. Four basic categories of data were converted to constant 1972 dollars for the purposes of the analysis presented in this report: state and local government (combined) PWI by (Census) region, state government PWI by region, local government PWI by region, and personal income by region. For all categories, the procedure was basically the same: 1) national-level indexes were chosen based on their presumed reliability and used to deflate national aggregate levels of PWI or personal income; and 2) regional deflators (discussed in Section 1.3) were applied to regional current dollar values, and the results were then scaled to conform to the national "control". In keeping with the present convention of the National Income and Product Accounts, all "constant dollar" estimates are based on 1972 = 100. The following sections describe the particular procedure employed for each general class of expenditure or income in greater detail.

2.3.1 Derivation of Constant-Dollar State and Local (Combined) PWI

The basic data sets for conversion of state and local government PWI from current to constant dollars are: Bureau of Economic Analysis' unpublished data, "1957-1977 State and Local Government Purchases, in Current and Constant Dollars"; Bureau of the Census' "Capital Outlay by State and Local Governments in Total and Selected Functions, by States" (aggregated to Census regions); Environmental Protection Agency Municipal Sewer and Sewage

Treatment Plant Indexes; and Engineering News-Record Construction Cost Index and Building Cost Index.

Briefly, the procedure consists of deriving function-specific, national level implicit deflators from the BEA data. These implicit deflators are then applied to each national aggregate functional category total from the Census data to develop constant-dollar national control totals for the functional categories. Both general purpose and function-specific regional deflators are applied to current-dollar expenditures by function at the regional level, and the resultant constant-dollar regional values are then scaled to the national control totals. This procedure allows for some degree of regional cost variation to be captured while ensuring that national control totals are met.

The detailed steps involved in this procedure include:

1. From the BEA functional categories and the categories broken out in the Census data, those which most closely approximate the functional categories of the Census data have been identified. This mapping is shown in Exhibit 2.2.

2. All values were converted to millions of dollars, and for each functional category (Total, Education, Highways, Health and Hospitals, Sewers and Sewage Treatment, Water Supply Systems, Other Utilities), Census region values were aggregated to the sum of the nation for each year 1957-1977; this figure is the national aggregate state and local "PWI" expenditures by function, in millions of current dollars.

3. Implicit deflators for each of the functional categories shown in Section 1.3.1 were calculated from the current- and constant-dollar values; these deflators were available only for the years of the unpublished data, 1959-1977.

4. The BEA data do not exist in the detail given above prior to 1959; therefore, the implicit deflators for these categories were estimated for 1957 and 1958. Assuming that costs across functional categories rose (or fell) in those years at the same rate as total State and Local Gross Fixed Capital Formation in 1959, we derived functional implicit deflators for 1958 and 1957 based on the relationships (ratios) between each of the function-specific implicit deflators and the implicit deflator for State and Local Gross Fixed Capital Formation in 1959.

Exhibit 2.2: Mapping of BEA Implicit Deflators to Census Current-Dollar Functional Categories, State Government PWI

Census, State Government PWI	BEA
Total	All Functions
Education	Education
Highways	Highways
Health and Hospitals	Health Hospitals
Correction	Correction
Miscellaneous Commercial Activities	Miscellaneous Commercial Activities
General Public Buildings	General Public Buildings
Water Transport and Terminals	Water
Public Welfare	Public Assistance and Relief
Natural Resources	Natural Resources
Liquor Stores	Liquor Stores

5. BEA derived implicit deflators from (3) and (4) by category were applied to Census functional categories according to the scheme outlined in Exhibit 2.2 to derive constant-dollar national aggregate values for the Census state and local government capital outlays.

6. Subnational-level indexes which were used to deflate regional state and local PWI expenditures by function are the Engineering News-Record 20 Cities indexes -- the Building Cost Index, a general price deflator for structures, and the Construction Cost Index, a general index for heavy construction -- and the EPA Municipal Sewer and Sewage Treatment Plant Indexes for the same 20 cities. To convert these city indexes to "regional" indexes, we computed the simple average of the indexes for those cities located within each Census region. The mapping of cities to Census regions is shown below:

Census Region	Cities
New England	Boston
Middle Atlantic	New York, Philadelphia, Pittsburgh
East North Central	Chicago, Cincinnati, Cleveland, Detroit
West North Central	Kansas City, Minneapolis, St. Louis
South Atlantic	Atlanta, Baltimore
East South Central	Birmingham
West South Central	Dallas, New Orleans
Mountain	Denver
Pacific	Los Angeles, San Francisco

Construction cost indexes were chosen to deflate capital outlay values due to their availability (no regional deflators for capital outlay as such have been identified). Since construction expenditures represent, on the average, approximately 80 percent of all outlays by state and local governments, it is believed that the use of construction cost indexes will give a reasonable approximation of inter-regional capital cost variations.

7. Regional deflators were applied to each category according to the following scheme:

Census Category	Regional Deflator
Education	ENR Building Cost Index
Highways	ENR Construction Cost Index
Health and Hospitals	ENR Building Cost Index
Sewers and Sewage Disposal	EPA Sewer and Sewage Treatment Plant (simple average)
Water Supply Systems	EPA Sewer and Sewage Treatment Plant (simple average)
Other Utilities	ENR Construction Cost Index
All Other Capital Outlays (derived as a residual)	Simple average of ENR, BCI and CCI

Constant-dollar "Total Capital Outlay" was then computed as the sum of the constant-dollar values of its components, as derived above. (Since "All Other Capital Outlays" include such diverse functions as Natural Resources, Airports, Water Transport and Terminals, Correction, General Public Buildings, Miscellaneous Commercial Activities, Veterans Services, Public Welfare, Liquor Stores, Police and Fire Protection and Other, a simple average of the two general purpose indexes was used).

8. Finally, for each year, constant-dollar values for each functional category were adjusted to national constant-dollar totals for the corresponding category by scaling as shown below:

$$\lambda_{it} \sum_{j=1}^{9} x_{ijt} = y_{it} \quad \text{or} \quad \lambda_{it} = \frac{y_{it}}{\sum_{j=1}^{9} x_{ijt}}$$

where: i = functional category;

j = region;

t = year;

λ_{it} = scale factor specific to functional category (i), in year (t);

x_{ijt} = capital outlay, in constant-dollars, in region (j) on function (i), in year (t) from item 7; and

y_{it} = national constant-dollar total capital outlay for function (i) in year (t).

2.3.2 Derivation of Constant-Dollar State Government PWI and Local Government PWI

The procedure to derive constant-dollar state and local PWI separately is similar to that used for deriving combined state and local government PWI in "real" dollars. The local government constant-dollar values were derived in a manner identical to that described in Section 2.3.1; however, for state PWI the procedure is different due to the greater number of functional categories.

In addition to those data sets cited in Chapter 1.0, the relevant data include "State Government Capital Outlay (PWI) by Region, Total, and by Functions" and "Local Government Capital Outlay (PWI) by Region, Total, and by Functions".

Steps (1) through (6) from Section 2.3.1 were carried out for state government PWI and local government PWI. The mapping of BEA implicit deflators to Census categories for state government PWI is shown in Exhibit 2.2 above. (Since local governmental capital outlays were only available as a complete series from 1961, this operation was performed for local government PWI for 1961-1977 only).

Regional deflators were applied to each category according to the following scheme for local PWI:

Census Category	Regional Deflator
Education	ENR Building Cost Index
Highways	ENR Construction Cost Index
Health and Hospitals	ENR Building Cost Index
Sewers and Sewage Disposal	EPA Sewers and Sewage Treatment Plant (simple average)
Water Supply Systems	EPA Sewers and Sewage Treatment Plant (simple average)
Other Utilities	ENR Construction Cost Index
All Other Capital Outlays (computed as a residual)	Simple average of ENR, BCI, and CCI

Regional deflators were applied to each category according to the following scheme for state PWI:

Census Category	Regional Deflator
Education	ENR BCI
Highways	ENR CCI
Health and Hospitals	ENR BCI
Correction	ENR BCI
Miscellaneous Commercial Activities	Simple average of ENR, BCI, and CCI
General Public Buildings	ENR BCI
Water Transport and Terminals	ENR CCI
Public Welfare	ENR BCI
National Resources	ENR CCI
Liquor Stores	NB: For this category, we used the BEA national-level deflator for Liquor Stores for Equipment from the BEA tape and estimated 1957-1958 as for other BEA implicit deflators.[1]
All Other Capital Outlay	Simple average of ENR, BCI, and CCI

Constant-dollar "Total Capital Outlay" was then computed as the sum of the constant-dollar values of its components, as derived above.

Finally, for each year, constant-dollar values for each functional category for each level of government were adjusted to national constant-dollar totals for the corresponding category by scaling as shown below:

$$\lambda_{it} \sum_{j=1}^{9} x_{ijt} = y_{it} \qquad \text{or} \qquad \lambda_{it} = y_{it} \Big/ \sum_{j=1}^{9} x_{ijt}$$

[1] This was based on the observation that, on the average, equipment expenditures accounted for approximately 75 percent of the capital outlays for Liquor Stores.

where: i = functional category;

j = region;

t = year;

λ_{it} = scale factor specific to functional category (i), in year (t);

x_{ijt} = capital outlay, in constant-dollars, in region (j) on function (i), in year (t) (from Item 8 in Section 2.3.1); and

y_{it} = national constant-dollar total capacity outlay for function (i) in year (t).

2.3.3 Procedure to Derive Personal Income in Constant Dollars

A complete description of the Consumer Price Indexes (CPIs) for Selected Cities/SMSAs is given in Section 1.3.2. The procedure for converting personal income from current to constant dollars is basically the same as that for the PWI data series:

1. All CPIs were first converted to 1972 = 100.

2. The mapping of CPIs to Census regions is shown in Section 1.3.2. Where there was more than one city or SMSA in a region, the simple arithmetic average was calculated. Where no CPI existed for a region, the CPI of a "contiguous" city was used (e.g., the Cincinnati, Ohio-Kentucky CPI was used for the East South Central Census Region). Since the CPI for Denver was available for 1964-1977 only, a simple average of the CPIs for Portland and Minneapolis was used for 1957-1963.

3. Preliminary constant-dollar estimates were calculated by applying the CPIs as described above to the regional current-dollar totals of personal income.

4. Total U.S. personal income was deflated by the implicit price deflator for personal consumption expenditure from the National Income and Product Accounts

5. The regional constant-dollar results of step (3) were then scaled to the national constant-dollar total personal income from (4) as follows:

$$\lambda_t \Sigma y_{jt} = y_{US_t} \qquad \text{or} \qquad \lambda_t = y_{US_t} \; / \; \Sigma y_{jt}$$

where: t = year;

j = region;

λ_t = scale factor for personal income in year (t);

y_{jt} = personal income, in constant-dollars, in region (j) in year (t); and

y_{US_t} = national constant-dollar total personal income in year (t)

The results -- personal income by region, in constant dollars -- were compiled into the CONSAD PWI Data Base.

APPENDIX C: REVIEW OF LITERATURE ON PWI AND REGIONAL DEVELOPMENT

TABLE OF CONTENTS

		Page
	LIST OF EXHIBITS	C.iii
1.0	OVERALL CONCEPTS OF PUBLIC WORKS INVESTMENT	C.1
	1.1 Determinants of Public Works Investment Expenditures	C.1
	1.2 Examples of Analytical Research	C.2
2.0	REGIONAL IMPACTS OF PUBLIC WORKS INVESTMENT EXPENDITURES	C.11
	2.1 Short-Run Impacts of PWI	C.12
	2.2 Long-Term Impacts of Public Works Investment	C.25
3.0	DEVELOPMENT IMPACTS OF PWI BY FUNCTIONAL TYPE	C.29
	3.1 Impacts of Public Investment in Highways on Regional Growth	C.29
	3.2 Water Resource PWI	C.32
	3.2.1 Overview	C.32
	3.2.2 Early Trends in Public-Private Relationships	C.33
	3.2.3 Changes in Concepts of Regional Development: The Four Account System	C.35
	3.2.4 Development of More Sophisticated Measures of PWI Impacts	C.40
	3.2.5 Summary and Interpretation	C.43

LIST OF EXHIBITS

Exhibit Number		Page
Exhibit 1.1:	Weidenbaum's Table of Federal Program Allocations	C.10
Exhibit 2.1:	On-Site Man-Hour Requirements Per $1,000 of Contract Cost, by Region	C.13
Exhibit 2.2:	Factors Positively Related to Share of Project-Generated Employment of Various Groups	C.15
Exhibit 2.3:	Percentage of Funds Expended in Each Six-Month Period by Various Programs	C.19
Exhibit 2.4:	Employment Created Per $100,000 of Program (1974)	C.23
Exhibit 3.1:	Total Money Capital Cost and Best Estimates of Shadow Capital Cost for the Twelve Project Types (in dollars per $1,000 of total contract costs)	C.42

1.0 OVERALL CONCEPTS OF PUBLIC WORKS INVESTMENT

In a study of public works investment in the United States, there is a need to examine the long-term characteristics of PWI; that is, how the type, magnitude and location of public investments contribute to the economic growth of the nation. While there has been little discussion in the literature dealing explicitly with "long-term impacts" of public investment, several studies have attempted to deal with various aspects of the question.

In this chapter, we will present the findings of several of these studies, particularly as they relate to the determinants of public works investment expenditures and their short-term and long-term impacts on regional (and national) economic development.

1.1 Determinants of Public Works Investment Expenditures

In a sense, it was not possible to perform a "comprehensive review of the literature" relating to public works investment. While there is a wealth of analyses of the factors which affect expenditures of the various levels of government and the locational patterns of such expenditures, little has been written addressing the specific category of public works investment expenditure as distinct from total government expenditures. What is, therefore, presented is a sampling of the literature as it relates to the factors which have determined the type, magnitude and location of public works investment in the United States in recent years, as well as the impacts of these expenditures. We have, in many cases, implicitly assumed that those factors which underlie the pattern of government expenditures may be equally useful in explaining the behavior of public works investment expenditures.

In many cases, the decision to undertake a public works investment project is a political one. Albert Hirschman has linked the political decision to economic or demographic variables. According to Hirschman, three principal patterns in regional allocation of public investments can be distinguished; dispersal, concentration on growing areas and attempts to promote the development of backward areas:

> ... the most important force opposing the tendency toward excessive dispersal of public investment is the growth pattern characteristics of rapidly developing countries. Development often begins with the sudden, vigorous, and nearly spontaneous growth of one or a few regions or urban centers, resulting in serious shortages of electric

power and water supply, as well as in housing and transportation bottlenecks. Thus, urgent demands for several types of capital-intensive public investment appear and must be given the highest priority. ... The public investment in overhead capital in turn makes possible further growth of industry and trade in the favored areas and this growth requires further large allocations of public investment to them.[1]

Public investment determined by the volume of private investment and the general rise in income in developing areas is said to be induced investment, i.e., investment which is directly related to past increases in output. "Adaptive" investments of this type respond to, or accommodate, ongoing growth in an area. However, a government may also pursue a policy of dispersal of public investments as a result of political pressure or equity considerations as well as pressure to spur development in stagnant areas. Hirschman refers to this latter category as "autonomous" investment, investment undertaken with the purpose of starting a region on the road to economic growth.

This analysis suggests a division of economic and demographic variables according to those which may be important in explaining a government's decision to locate a public works project as well as the type of public works investment one would expect to see take place. That is, public investment in the form of "social overhead capital" -- transportation, electric power stations and utilities -- would be more likely to be undertaken in underdeveloped or stagnant areas, characterized by low income, outmigration, and high unemployment, as exemplified by the intensive investment in highway transportation in Appalachia. One would expect public investment of an adaptive nature -- investment in educational facilities, sewers, hospitals -- to predominate in regions experiencing high rates of growth of income, population, and employment.

1.2 Examples of Analytical Research

In an earlier study performed for the Economic Development Administration, CONSAD sought to determine the extent to which public investment in social overhead capital is adaptive in nature.[2] A set of functions was estimated relating public investment in each class of social overhead capital in the same region in the preceding year. The results indicated that public investment in sewer systems, basic education, and real estate are probably adaptive in nature, while public investments in higher education, ports and docks, highways, and housing and rural communities may be adaptive.

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[1] Hirschman, Albert, The Strategy of Economic Development, Yale University Press, New Haven, Connecticut, 1968, pp. 192-193.

[2] CONSAD Research Corporation, Long Run Regional Development and Policy Impacts: A Case Study of Puerto Rico, prepared for the Economic Development Administration, U.S. Department of Commerce, Washington, D.C., 1974.

As part of a separate study performed for the Economic Development Administration, CONSAD established a qualitatively based cost-benefit evaluation procedure for EDA public works allocations. CONSAD estimated the benefits expected to result from public investment by the EDA in various types of projects. The method was then applied to derive impact estimates.[1]

Based upon an understanding of the economic and statistical analytic issues, of the current state-of-the-art and of the general availability of data, a procedure for impact estimation was developed. Based upon an evaluation of the data that was acquired, and upon several preliminary tests, this procedure was substantially modified, and, together with a procedure for evaluating causal directionality, an operational impact estimation method was developed. This method was restricted to use in estimating the average historical impacts of specific types of public works in a sample of towns, rather than in estimating the benefit impacts in a given region that would be expected to result from public investment.

The estimation technique, in its modified form, was then applied to the analysis of data obtained for 195 small municipalities in Missouri (average 1966 population, 5,000-7,000). The analysis provided the following information: of the seven types of public works projects evaluated, the estimates for highways and barge docks were inferentially found to have causal impacts upon economic growth; the estimates for water, sewer, and airport facilities were inferentially found not to have causal impacts; and estimates for recreational facilities and vocational-education schools were found inconclusive in terms of causality. The average growth of total income during the period 1963-1965 in the 195 municipalities was then attributed to the seven types of public works inventoried in these towns. Highways, recreational facilities, and vocational-education schools accounted for the largest shares of average income growth, while water, sewer and airport facilities accounted for the smallest shares. Barge docks accounted for the largest amount of growth on a per-unit basis, but because only 11 percent of the towns were situated on navigable rivers and had barge docks, this type of investment accounted for only a moderate share of the average three-year municipal income growth.

Finally, the use of analysis of variance provided evidence of the existence of a joint "necessary conditions" threshold effect upon growth where a minimum combined level of water-supply and sewage-treatment capacity must be attained for any growth at all to occur. Results were inconclusive for public investment in industrial parks.

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[1] CONSAD Research Corporation, A Study of the Effects of Public Investments, prepared for the Office of Economic Research, Economic Development Administration, Washington, D.C., (NTIS, PB 184-084), 1969.

The CONSAD study points out the difficulty involved in any attempt to analyze public works investment impacts. Even on a small scale, certain types of public investment were found to be correlated with economic growth. The complexities involved in an analysis of the effects of public works investment on a large scale render such an effort beyond the scope of the present study.

Tests of the importance of several economic and demographic variables on local government expenditures were performed by George Pidot.[1] This cross-sectional analysis used variables for the period 1960-1963 on a sample of cities and state-local government aggregates. Per capita local government expenditures (including both investment and all other expenditures) were regressed on density and growth rate of population, per capita income and property values, and state and Federal aid.

The availability of state and Federal money for specific purposes was seen as encouraging local officials to favor categories of spending which have a large component of outside financing as well as permitting greater outlays for non-aided functions by reducing financial pressures. State outlays for specific functions were included as well, since where state outlays are higher, it is expected that local outlays for the same function will be lower.

Population density was included to reflect the fact that there is increasing need for public rather than private provision of certain types of public investments (e.g., sewers) in more densely populated areas. The rate of population growth is believed to have a positive effect on expenditures for capital projects due to what Pidot believes is a "general tendency not to replace worn-out facilities in older areas" which tends to "accentuate the apparent impact of growth in those areas which are currently expanding".[2] In other words, Pidot believes that a general tendency not to replace worn-out facilities, or not to invest, in older declining areas, i.e., areas that are losing population, may make the relationship between population growth and capital outlays in areas experiencing growth (of population) appear stronger than it is. Moreover, age variables are believed to be important because they reflect the special needs of certain age groups e.g., medical facilities for the aged, and education for the school-age segment.

The economic base of the region (as measured by taxable property or retail sales) is important as a potential source of revenue as well as a determinant of demand for public services. Finally, the level of personal income is included, since a higher per capita income area will demand a greater variety and higher quality of educational, recreationaly, and other services.

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[1] Pidot, Jr., George B., "A Principal Components Analysis of the Determinants of Local Government Fiscal Patterns", Review of Economics and Statistics, Vol. 51, May 1969, pp. 176-188.

[2] Ibid.

To reduce the problem of multi-collinearity among the variables, equations were estimated by means of principal components analysis. Pidot found a "metropolitan" component to be the single most important variable, associated with higher levels of outlays for social welfare, protection, renewal, sewerage and sanitation and other government functions. The wealth component had a mixed impact, associated with greater outlays for education, sewerage, and fire protection, but smaller outlays for public hospitals, urban renewal and housing, and sanitation.[1]

The general size measure had a positive effect on capital outlays for schools, sewers and public buildings, and the equations supported the hypothesis that state aid tends to stimulate greater outlays for a wide variety of functions and to increase locally-financed spending generally. Pidot found that there were two sets of causes for generally higher spending -- those related to the educational-highway group, which are generally high in areas at an earlier state of development, and those for the social welfare-protection group, which are high in older areas. His findings seem to support, at least in part, Hirschman's analysis of the dichotomous adaptive/developmental nature of public investment expenditures.

The effect of demographic variables on levels and types of public expenditure is discussed by John Riew, who cites population density as an important variable in explaining variation in local government expenditures and particularly with respect to the types of expenditures referred to as adaptive by Hirschman:

> ... one may argue that higher expenditures in larger areas may be attributed to the greater range of services there, however, many of these added services are merely of a compensating nature, such as higher provisions of inevitably more hazardous fire, health and sanitation problems, for instance.[2]

He adds that higher expenditures are to be expected as a result of greater levels of pollution (due to, for example, higher maintenance costs resulting from air pollution, greater expenditures on water treatment plants from water pollution), higher crime rates and other "adverse consequences of 'urbanization".[3]

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[1]Because expenditures for education, highways, sewerage and urban renewal are broken out into "capital" and "current" expenditures, the "capital" component for these functional categories could be used, but total expenditures had to be used for the others.

[2]Riew, John, "Migration and Public Policy", Journal of Political Science, Vol. 13, No. 1, 1974, pp. 65-76.

[3]Ibid, p. 70.

Moreover, migration is seen by Riew as entailing a social loss due to the difficulties involved in adjusting the stock of public overhead capital. What may result is under-utilization of public assets due to outmigration in the declining area, and the need for new or additional public overhead capital in the area experiencing inmigration.

The problem of migration and the public overhead capital stock was also addressed in an essay by Barbara Moffer of the Congressional Research Service.[1] She showed that the mean income of families moving out of central cities was greater than that of families moving in, resulting in a decline of the cities' tax base. This leaves the area unable to deal effectively with the problem of excess (and often aging) housing, infrastructure and facilities in declining, depopulating areas while creating burdens for newly growing areas which must increase their stock of public facilities to cope with increasing population. She suggests that the outmigration problem is particularly troublesome for declining metropolitan areas, which are not only losing population and their tax base but must face increased demand for public services as the concentration of low-income persons residing there increases.

Demographic factors affect the provision of public services and infrastructure not only as they affect demand, but as they impact on supply-cost conditions. Ohls and Wales[2] found that the wage rate in a region, as well as variables representing population change and density, and metropolitan population are important and significant in explaining the supply of non-Federal services. Wages are important primarily as an input cost, while population density and metropolitan population were seen to represent cost differences attributable to demographic characteristics. Density and metropolitan population were particularly important in explaining highway expenditures, but were not significant determinants of local expenditures.

Borcherding and Deacon derived a model of public spending and tested the significance of certain variables as important determinants of levels of state and local government expenditures.[3] The authors estimated four equations, representing four demand functions:

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[1]Moffer, Barbara, in Congressional Research Service, Selected Essays on Patterns of Regional Change: The Changes, The Federal Role and The Federal Response, submitted to the Committee on Appropriations, U. S. Senate, by Senator Henry Bellmon, U. S. Government Printing Office, 1977.

[2]Ohls, James C., and Terrence J. Wales, "Supply and Demand for State and Local Services," The Review of Economics and Statistics, November 1972, pp. 424-430.

[3]Borcherding, Thomas E., and Robert T. Deacon, "The Demand for the Services of Non-Federal Governments," American Economic Review, December, 1972, pp. 891-901.

1) Per capita expenditure as a function of wages, population, and income.

2) Per capita expenditure as a function of wages, population, income, and urbanization.

3) Per capita expenditure as a function of wages, population, income, and state land area.

4) Per capita expenditure as a function of wages, population, population, income, urbanization, and state land area.

Two sets of regression results were presented: one table showed the results of estimating equation 1); the other showed results of equations 2), 3) or 4) according to whether their inclusion increased R^2 or produced parameter estimates that differed significantly from those obtained from the estimates of 1).

They found that the inclusion of urbanization and land area variables had little impact on parameter estimates, but that the coefficient showing the partial effect of population dispersion as a variable explaining per capita expenditure was positive for local education, higher education, and highways, suggesting an inverse relationship between per capita expenditure on these categories and population density. Urbanization was significant and positively related to per capita expenditures for police and fire protection (which supports Riew's analysis of the increasing need to provide these services as urbanization increases). Moreover, Riew found that economies of scale seemed more evident than diseconomies in public education which may help explain Borcherding and Deacon's finding of higher per capita expenditures on education as population disperses. The result for highways is the expected one, based on the authors' suggestion that per capita demand for highway services would be greater in states with large land area than with smaller land areas, as well as Hirschman's analysis of the autonomous or developmental nature of transportation investment which he would expect to be associated with a more dispersed population.

In addition to the customary measures of expenditure needs, Gramlich and Galper[1] have attempted to ascertain to what extent Federal grants are determinants of the level of state and local expenditures. They define a variable which contained all demographic factors which affect government spending. These included the number of school age children, a proxy for educational needs, the number of families headed by females, a proxy for welfare and social service needs, and the robbery rate, a proxy for needs for expenditures on public safety. It was expected that expenditures would increase with these variables.

[1] Gramlich, Edward M., and Harvey Galper, "State and Local Fiscal Behavior and Federal Grant Policy," Brookings Papers on Economic Activity, Vol. 1, 1973, pp. 15-65.

Other variables believed to affect the level of expenditures were real income (which makes communities "better off" and induces them to spend more on public goods), mandated expenditures under categorical grants, relative prices (which affect discretionary spending), and stocks of real public capital as represented by cumulative past investments measured in real terms (states and localities will invest the more capital they have). Their results showed that revenue sharing will have less impact on expenditures than categorical grants, since it is shown that states and localities will first accumulate more financial assets in response to revenue sharing funds and will only gradually use this new wealth to increase expenditures.

Legislative mandates and various public works programs of the Federal government have made characteristics, other than those related to demographics and urbanization as mentioned above, increasingly important. Philip Winters, in Selected Essays on Patterns of Regional Change: The Changes, The Federal Role and The Federal Response,[1] has shown that, of the four large Census regions, the South has tended to rank first in obligations and outlays among Federally funded public works, due in large part to the pecularities of the formulae for allocating these funds. Since the South is the poorest of these regions, it will receive funds allocated on the basis of low incomes. The South also encompasses the largest number of states and thus will receive, as a region, a larger share of those funds distributed on the basis of minimum allotment to each state. And the South has the largest percentage share of both population and land area, qualifying it for a larger proportion of monies distributed based on those factors.

Other factors which will affect the level and location of public works investment expenditure are seldom mentioned in the literature. These include such variables as climate, topography, available land space, and national and local needs. Regional levels and types of public investment will vary to a great degree as these characteristics vary. For example, climate has been an important factor affecting the location of certain national defense installations, particularly those related to the aerospace program. Topography has been a particularly important determinant of the type and level of public investment in such areas as water resources and flood control. An analysis of factors underlying the level, type and location of public investment must recognize the importance of these regional characteristics in addition to the regional differences in income, population, and degree of urbanization.

Finally, the type, magnitude and location of public investments will depend on the level of government making the expenditure. Those factors which will affect the level and composition of state and local expenditures have been described in some detail in this section. Those factors which will determine the location, amount and mix of Federal government

[1] Congressional Research Service, op. cit.

expenditures on public works investment are many and complex. A complete cataloging of them is beyond the scope of this study. One important determinant, however, will certainly be the composition of the national budget.

Weidenbaum[1] has shown that the regional distribution of Federal spending for defense and space programs differ "quite significantly" from the pattern of non-defense programs. Low income states tend to receive a larger share of non-defense expenditures (reflecting a "welfare" orientation" of such programs), while high income states tend to receive greater expenditures for defense and space programs, reflecting that sector's dependence on the highly industrialized areas for technical and manufacturing support (and lending support to Pidot's allegation of the importance of the economic base as a significant determinant of the type and level of public investment). Thus, to the extent that the composition of the Federal budget shifts from defense to non-defense (or vice versa), we would expect to see levels of public investment in the regions which favor these activities increase or decrease accordingly.

Weidenbaum showed that in 1964, for example, the Mideast and New England Regions received their greatest relative share of expenditures in defense programs and the smallest share in reclamation programs, while the Rocky Mountains and Southwest experienced greater relative expenditures in reclamation and the least expenditures in Corps of Engineers and NASA programs (Exhibit 1.1).

The extent to which public works investment represents a significant part of the outlays of any of these programs will play a part in the level of public investment by the Federal government in that region. One would expect, for example, to find a greater share of defense outlays allocated to capital formation than outlays for farm subsidies. Moreover, to the extent that one or more categories become a greater or more important part of the Federal budget, regional levels of these expenditures would be expected to shift accordingly.

This description of theory and empirical evidence relating the importance of various underlying factors in explaining or determining the composition, level and location of public works investment is by no means exhaustive. An attempt has been made, however, to impart some of the flavor of what analysts have found to be the most important determinants of such activity. The results are at times unclear and often contradictory.

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[1] Weidenbaum, Murray L., "Shifting the Composition of Government Spending: Implications for the Regional Distribution of Income," Papers and Proceedings of the Regional Science Association, Vol. 17, 1966, pp. 163-167.

Exhibit 1.1: Weidenbaum's Table of Federal Program Allocations

Region	Program in Which it Obtains Largest Share	Program in Which it Obtains Smallest Share
Far West	NASA	Farm subsidies
Mideast	Defense	Reclamation
New England	Defense	Reclamation
Great Lake	Highways	Reclamation
Plains	Farm subsidies	Defense
Rocky Mountains	Reclamation	Corps of Engineers
Southwest	Reclamation	NASA
Southeast	Education	Reclamation

Source: Weidenbaum, op. cit., p. 165.

2.0 REGIONAL IMPACTS OF PUBLIC WORKS INVESTMENT EXPENDITURES

The regional economic development impacts of PWI may be divided into two areas for discussion and analysis -- the short-term employment-generating effects (sometimes referred to as "counter-cyclical") of such expenditures, and the long-term effects on regional structure, income, and employment. The latter effects are more difficult to pin down since, until now, no comprehensive study (of which we are aware) of these effects has been performed. In this chapter, we will first discuss the theory and evidence regarding the regional and interregional effects of PWI in the short run, particularly as they relate to income and employment. Then, we will address the question of how PWI affects the structure and economic well-being of a region in the longer run.

Before addressing these topics, it may prove useful to specify the theoretical basis which will be largely implicit in our treatment of the "impacts" question. An excellent summary of the theories of regional economic growth and development as they relate to public investment was presented in an earlier CONSAD study.[1] Three theories were considered to be applicable to a study of the effects of public investment -- location theory, trade theory, and regional-demand theory:

> An increase in the supply of public facilities in a depressed area (presumably accomplished through increased public investment) will reduce local factor scarcities and thereby increase the potential for gain from production in that area. Both location and trade theory are relevant in determining the extent and type of the industrial expansion directly resulting in the area. In turn, direct industrial expansion may be followed by the growth of ancillary industry (location and trade theory); and production activities in both industries will create employment and income which, in their turn, will generate secondary demands for the output of other sectors of the area economy (regional-demand or multiplier theory). Finally, the resulting expansion of the area economy may lead to contraction or expansion in the economies of other areas, and these effects are subject to analysis through location, trade, and regional-demand theory.
>
> Secondary expansionary impacts, then, are to be analyzed through regional demand theory. Primary and ancillary impacts, however, may be analyzed through location and trade theory, and spread effect to other areas are subject to analysis under all three theories.[2]

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[1] CONSAD, A Study of the Effects of Public Investments, op. cit.

[2] Ibid., p. 3.10.

2.1 Short-Run Impacts of PWI

The short-term employment, or "counter-cyclical" impacts, of public works investment are generally analyzed within the framework of regional-demand theory, which holds that a one-period increase in autonomous investment expenditures will result in an economic expansion in income or employment as a result of the Keynesian investment multiplier, the export multiplier or the interindustry multiplier.[1]

Ball found that "more than half the jobs created by construction expenditures are in the various stages of manufacturing, mining, trade and transportation industries that produce, sell, and delivers materials required for construction activities; slightly less than half the jobs are in the construction industry."[2] Moreover, employment impacts will differ according to type of construction being undertaken, as shown in Exhibit 2.1.

For those categories which can be readily identified as "public works," it may be seen that public housing construction required more man-hours than did either highways, Federal office buildings, schools or civil works.

Not only do man-hour requirements (and therefore, employment-generating impacts) differ functionally, but Ball has determined that they may differ regionally as well, as described in Exhibit 2.1.

These variations reflect to a large extent regional differences in design, wage levels, size of projects, and the extent to which prefabrication was used. Ball cites as an example, the phenomenon of lower wages in the South, which result in the more frequent use of laborers and helpers for most types of building construction, thus increasing on-site hours.

Regional variations in the employment-generating impacts of public investment will be particularly important to policy-makers trying to implement programs designed to alleviate unemployment in a given area. Such a program was the Public Works Impact Program of 1971, whose purpose was to provide "immediate useful work to unemployed and underemployed persons" in distressed areas through the construction of needed public

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[1] Ibid.

[2] Ball, Claiborne, "Employment Effects of Investment," Monthly Labor Review, March 1965, pp. 154-160.

Exhibit 2.1: On-Site Man-Hour Requirements Per $1,000 of Contract Cost, by Region

	Northeast	North Central	South	West
Schools	76.0	82.6	99.0	80.6
Hospitals	91.4	85.0	95.3	81.1
Federal Office Buildings	110.4	100.2	96.0	89.2
Public Housing	95.9	106.0	142.1	98.4
College Housing	85.0	86.9	111.5	84.3
Private One-Family Housing	73.5	61.4	91.4	56.8

Source: Ball, op. cit., p. 158.

facilities.[1] An evaluation of this program by EDA produced the following findings (also shown in Exhibit 2.2):

- The program's intended beneficiaries -- "previously unemployed and underemployed impact are residents" -- received a minor share of the benefits;
- The program generated less employment than anticipated at a greater-than-anticipated cost;
- The program had little effect on impact-area unemployment rates;
- Employment generated by the program was "both pro-cyclical and pro-seasonal, occurring at the same time that other expansionary forces were at work within the national economy"; and
- Duration of employment on program projects was "considerably shorter than anticipated."

Although the employment-generating impacts of the program were less than desired, certain factors were found to be associated with greater employment impacts for the targeted group. Force account projects were found to generate more employment among unemployed impact-area residents than contract-bid projects. Among contract construction projects, a greater impact was found to be associated with the nearness of the project contractors to the impact area (presumably, "local" contractors would be more likely to draw from the local labor pool rather than bringing workers from outside the impact area). Employment impacts were also found to be greater in those targeted areas where unemployment rates were high and where projects were undertaken requiring relatively greater amounts of unskilled labor. Among the various types of public works impact projects evaluated, construction of parking structures showed the greatest employment impact on target-group workers.

Employment impacts of public works investment may vary according to the function or type of investment being undertaken and the region in which the investment is located. William Tobin, in a study performed for the Economic Development Administration, states:

> It has long been hypothesized by economists that the impacts emanating from or associated with, public works investments should increase measurably with the passage of time. In fact, one of the legislatively stated purposes of the Economic Development Administration's

[1] Sulvetta, A. L., and N. Thompson, An Evaluation of the Public Works Impact Program (PWIP), Economic Development Administration, U. S. Department of Commerce, April 1975.

Exhibit 2.2: Factors Positively Related to Share of Project-Generated Employment of Various Groups

	Impact Area Residents	Unemployed Impact Area Residents	Previously Unemployed
Force account or bid status of project	X	X	X
Size and proximity of nearest SMSA	X		
Contractor location	X	X	X
Size of impact area labor force	X		
Unemployment rate in impact area		X	X
Skill requirements of project		X	X

Source: Sulvetta and Thompson, op. cit.

(EDA) public works program is that it enables depressed areas to achieve lasting improvements by establishing stable and diversified local economies and long-term employment opportunities.[1]

The study drew a sample of 50 public works projects, from 125 EDA-funded projects which had been previously evaluated, in order to perform a longitudinal analysis of the economic impacts resulting from these projects. Projects were evaluated on several aspects: their development process impact, i.e., how the local process of economic development improved over the period; their service impact, the impact of the project on the provision of improved public services to the poor; job impact, the number and type of actual jobs -- both direct and indirect -- created as a result of the project; and their structural impact, an evaluation of the jobs provided in relation to the needs of the local community for stable employment and employment diversification opportunities for targeted groups.

The study found that the projects showed greater employment impacts in 1974 than during the first survey in 1970. Not only were there significant increases in "direct" jobs and total jobs, but there were "concomitant average decreases in the EDA costs per job." Of the project type groups in the sample, two types -- water/sewer and industrial/commercial -- tended to exhibit a greater surge in employment impacts during the inter-survey period.[2]

In terms of the overall development process of the locale in which the EDA-funded projects were situated, the "average continued growth patterns between 1970 and 1974 (were) noteworthy," and industrial/commercial projects were judged "on the average during the period to have been a 'significant factor' contributing to the overall local development." Service impacts were more difficult to measure, but the average structural impacts were judged to have "contributed to the overall growth and stability of the local communities."[3]

This concern with local economic stability and diversification of employment has several precedents in public works investment programs of recent years:

> In 1961, the Area Redevelopment Administration was created to reduce unemployment in distressed areas through business investment and long-range public works investments. When

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[1] Tobin, W. J., A Comparative Analysis of the Impacts Resulting from Fifty Public Works Projects, 1970-1974, U. S. Department of Commerce, Economic Development Administration, 1974, p. 105.

[2] Ibid.

[3] Ibid.

this agency was unable to significantly reduce the level of unemployment, the Federal government embarked on a massive program of accelerated public works (APW) projects. This program was aimed at pump-priming the economy and providing useful, immediate employment opportunities for locally unemployed individuals. Again in 1971, a modified program of accelerated public works aimed primarily at providing immediate, useful employment for the unemployed and underemployed residents of designated areas (the Public Works Impact Program) was begun under the administration of the Economic Development Administration. Unlike APW, however, pump-priming is not an objective of PWIP.

Finally, in 1974, the nationwide recession prompted the establishment of the Title X "Job Opportunities Program" administered by EDA, through numerous offices in Federal departments, agencies and regional commissions. Although enacted in response to the most severe recession of the post-war period, the Title X program was, like APW and PWIP, targetted on areas of unusually high unemployment. In contrast to these two programs, however, Title X combined both construction and public-service-type employment.[1]

The preceding discussion thus identifies two general categories of public works which differ as to their purpose and function. Sulvetta and Tobin state:

> It is essential...to understand the distinction between regular public works and public works programs for public works as: "All construction activity undertaken by the national, state or local governments, and financed with public money. The term usually implies durable, immobile types of construction of a less routine sort." Similarly, John Maurice Clark describes public works as "...all construction projects undertaken by governmental agencies national or local, and financed from public funds." Throughout the 1930's, the distinction between regular public works -- referring to "construction activity undertaken by the government, presumably without reference to cyclical or secular conditions of employment" -- merged with that of planned or timed public works, and the construction of public works came to be utilized as an instrument for economic stabilization and as a remedy for business fluctuations.[2]

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[1] Sulvetta, A. J., and W. Tobin, "Alleviating Unemployment Through Accelerated Public Works in the U.S.: An Historical Perspective" (unpublished report available from CONSAD Research Corporation library), p. 79.

[2] Ibid., p. 2.

Employment generated is an important measure of the effectiveness of any public works investment scheme; when such investments are undertaken for the purpose of economic stabilization, the speed with which such projects can create jobs becomes paramount. Maisel has detailed the types of political, administrative and technical delays inherent in the implementation of any public works programs.[1] In addition to delays in implementation, the very nature of public works construction is such that "injections" of expenditures may not take place until several months after the onset of a business downturn, and make it difficult to accelerate projects in progress. Estimates of time requirements for the starting of expenditures for various types of public works programs were made by Maisel (Exhibit 2.3). Such variations in timing result:

> ...partly because of differences in engineering time but also because of differences in time required to organize the work, some projects proceed at a much more rapid rate than others. Thus, soil conservation and similar projects proceed rapidly. Roads, highways, and airports also can be completed at a fairly good speed. On the other hand, large-scale buildings and housing projects require more time. At the end of the scale are dams and similar reclamation or flood control projects, which can be completed only at a very slow pace.[2]

Moreover, project size affects the timing of expenditures, and therefore the rapidity with which such a program can be expected to bring on or accelerate economic recovery:

> Small projects of any type can be completed rapidly. But as the size increases, so does the length of time required. This means that in programs composed primarily of large projects, expenditures will, of necessity, be spread over a long period.[3]

However, the size of a public works program must be adequate to meet counter-cyclical needs, i.e., total spending must be great enough to restore full employment. Such seemingly contradictory criteria have led Teigen to observe:

> In practice it has proven difficult to put together a program that is large enough in the aggregate to produce a major impact on GNP while at the same time being

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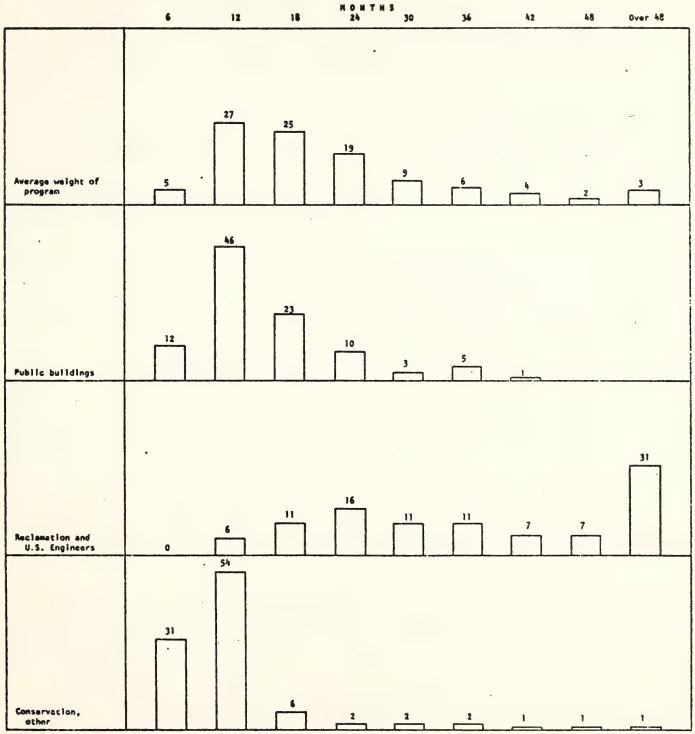
[1] Maisel, Sherman, "Timing and Flexibility of a Public Works Program," Review of Economic Statistics, Vol. 31, May 1949, pp. 147-152.

[2] Ibid., p. 151.

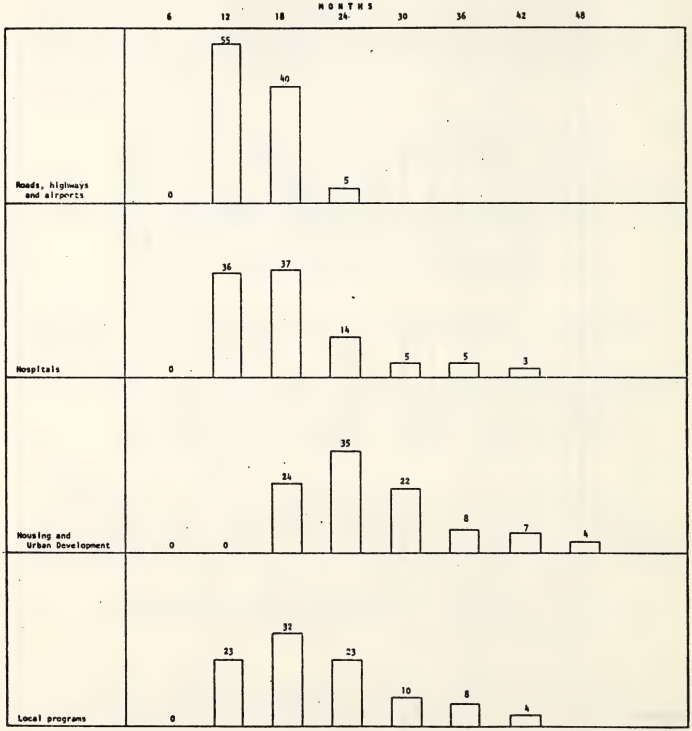
[3] Ibid., p. 152.

Exhibit 2.3: Percentage of Funds Expended in Each Six-Month Period by Various Programs



Source: Maisel, op. cit.

Exhibit 2.3: Percentages of Funds Expended in Each Six-Month Period by Various Programs (continued)



> composed of individual projects that are sufficiently small and flexible to be capable of being achieved rapidly.[1]

Discussions of counter-cyclical uses of public works investment have generally emphasized its implementation in times of depression. As Teigen observed, public works are not very effective as an anti-inflation tool and may even exacerbate that phase of the business cycle since, due to the lags involved, projects may carry over into the economy's upswing.[2] The effectiveness of public works investment as a counter-cyclical device is, therefore, limited by timing considerations. It is, as one observer put it, "slow to start, difficult to stop."

As to the effectiveness of public works in generating employment, or, more appropriately in this context, alleviating unemployment, there is no guarantee that those resources unemployed as a result of the downturn are being employed by such programs. As Sulvetta and Thompson have shown, public investment programs may be competing for scarce resources already fully employed by the private sector:

> Emergency or accelerated public works programs, on the other hand, are basically designed to hire the employable unemployed for construction of needed public facilities requiring larger proportions of skilled and semi-skilled labor (depending on the project), and generally require a greater lag time between the decision to undertake construction activity. Since project construction activities may require particular skills unavailable among the unemployed, employment on emergency or accelerated public works programs is normally limited to unemployed workers on relief, nor even to the unemployed regardless of relief status.[3]

Teigen concluded that public works investment may be most effective as a counter-cyclical tool in periods of prolonged unemployment where there are serious pockets of distress, since public investments can be targeted to an area more readily than can, for example, tax policy.[4]

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[1] Teigen, R. L., "The Effectiveness of Public Works as a Stabilization Service," in Readings in Money and National Income and Stabilization Policy, W. L. Smith and R. L. Tiegen (eds.), Homewood, Illinois, Irwin Dosey, 1970, p. 172.

[2] Ibid., p. 174.

[3] Sulvetta and Tobin, op. cit., p. 3.

[4] Teigen, op. cit.

A recent study by The RAND Corporation describes how regional-demand theory would explain the process by which public works investment leads to increased employment in several ways.[1] First, in addition to the autonomous increase in expenditure, any change in government spending will affect the marginal propensity to consume (MPC) -- to the extent that government programs redistribute income from those with a low MPC to those with a higher MPC, consumption will rise. Also, if people perceive government spending as "providing a stream of valuable services in the future" in the construction of roads, parks, and other public facilities, their perceived "wealth increases and this encourages increased present consumption.[2] (Vaughan has pointed out that the first effect will be the sole outcome of public employment or "work-relief" projects, while public works investment will encompass both effects.)

The second way in which a public works investment program will generate employment is described by Vaughan as follows:

> The demand for investment goods and services is basically derived from the demand for consumption goods. Therefore, to the extent that government spending induces an actual (or even an expected) increase in consumption expenditure through the channels identified above, an accompanying increase in investment expenditure should be expected. In addition, private investment expenditure might be induced if the Federal projects have increased the expected rate of return on complementary private projects. For example, if the Federal government constructs a road, then the value of constructing homes or businesses on adjacent land will increase.[3]

Vaughan identifies two resulting employment effects: short-run employment resulting from construction activity and demand for materials, and long-run employment associated with operation and maintenance of the facility and indirect employment created in the community. Short-run employment effects, usually evaluated through input-output analysis, are the easiest to estimate. Hannon and Bezdek used the input-output technique to estimate the employment-generating impacts of various types of Federal expenditures, as shown in Exhibit 2.4.

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[1] Vaughan, Roger J., Public Works as a Counter-Cyclical Device, The RAND Corporation, R-1990-EDA, July 1976.

[2] Ibid.

[3] Ibid.

Exhibit 2.4: Employment Created Per $100,000 of Program (1974)

Federal Program	Jobs Per $100,000
Corps of Engineers	6.5
Highway Construction	8.1
Railroad and Mass Transit Construction	8.4
Water and Waste Treatment Facilities Construction	8.2
Educational Facilities Construction	8.5
National Health Insurance	13.4
Criminal Justice and Civilian Safety	12.4
Personal Consumption Expenditures (Income Tax Rebate)	8.7
Social Security Benefits	8.5

Source: R. Hannon and J. Bezdek, "Job Impacts of Alternatives to Corps of Engineers Projects", Engineering Issues, October 1973, pp. 521-531; reprinted in Vaughan, R., op. cit.

As Exhibit 2.4 indicates, among public works-type expenditures, the greatest number of jobs per $100,000 of construction expenditure are generated by construction of educational facilities, while U. S. Army Corps of Engineers projects have the least impact on employment.

According to Vaughan:

> Local impacts also differ according to the industrial diversity and size of the region. Large diverse areas, because they can supply a greater share of the material and service inputs, experience a greater increase in employment for a given project than do smaller, less diverse regions.[1]

Evidence supporting these statements was presented earlier in this section in the discussion of the work of Sulvetta and Thompson.[2]

To conclude this section on the regional, short-term employment impacts of public works investment, we cite the findings of the RAND study:

> Of those policies that can be applied at the local level, public employment programs offer some major advantages. They can be aimed at population groups and areas in need and can be implemented rapidly. However, there are problems in incorporating temporary jobs in the municipal employment structure, and the multiplier impact may be diminished by the fact that the value of the jobs may be relatively small.
>
> In comparison, public works programs may offer a considerable employment impact particularly in the medium to long run. They can be selected according to the needs of particular regions and, since their principal cost is simply the early implementation of projects that would have been constructed eventually, their social cost is very low. Their principal disadvantage lies in the fact that they are difficult to implement fast enough to generate jobs during the recessionary period.[3]

These "medium to long run" impacts on employment, income, and output of regions will be the subject of the section which follows.

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[1] Ibid.

[2] Sulvetta and Thompson, op. cit.

[3] Vaughan, op. cit.

2.2 Long-Term Impacts of Public Works Investment

Studies of public works investment which describe how such expenditures can be expected to affect a region's employment, income and output in the medium-to-long run have utilized all three of the theories of regional economic development alluded to in this CONSAD study to explain public investments role in regional growth.

The contribution of public investment to regional economic growth may be simply viewed as an addition to the region's capital stock and thus analyzed within the framework of a factor supply growth model. Such a model holds that a region's potential for growth is determined by the rate of growth of population, the rate of capital investment, and the rate of technical progress. According to Borts and Stein:

> Growth in output can come from one of three sources: (1) an increase in the quantity of capital and labor resources; (2) technological change that makes either capital or labor more productive than it had been previously; or (3) reallocation of capital and labor resources from less productive to more productive industries.[1]

Additions to the stock of public infrastructure would, according to this analysis, result in regional economic growth since they increase the stock of capital, making labor more productive and resulting in increases in regional income and output. Additionally, to the extent that such an investment represents a technological advance, regional output will be increased. And, in the case where competitive imperfections exist in the pre-investment situation, interregional allocation of resources may not be optimal. Public works investment then represents a reallocation of capital resources from less productive regions to more productive regions and, as it is often argued, the recipient region may experience growth in output and income because of increased productivity.

Romans and Garnick have argued that the redistributive effects of public investment, because of a more optimal resource allocation, will generate net national benefits, i.e., that public investment may not represent a zero-sum game, or that a region(s) does not necessarily benefit from public investment at the expense of another region(s) since these benefits include the employment of otherwise unemployed resources. Additional sources of national benefits would include "technological externalities and agglomeration effects external to decision-making units" which may be internal to regional economies (such as an intra-regional highway system) or external to regional

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[1] Borts, G. H., and J. S. Stein, Economic Growth in a Free Market, New York, New York, Columbia University Press, 1964.

economies (such as the nationwide Interstate Highway System). Capturing such externalities would then become a target for national policy. In certain cases, one might expect this to be more true as the decision-making units are smaller, as in the case of the "Balkanized" Appalachian region. One might also expect that the benefits realized would rebound to a larger area than the region where the expenditure takes place.[1]

The RAND study, for example, cites three ways in which public works may result in long-run employment benefits to a region: 1) direct employment impact due to an increase in local employment will be made necessary by the project itself; 2) the increase in employment from firms attracted to the area as a result of the project; and 3) the employment increase in support activities and services due to the increase in demand from 1) and 2):[2]

> Public works projects may increase the attractiveness of a region to certain industries. For example, the construction of a road may open up low-priced land to firms that are heavy users of land. Less directly, a project that attracts people to an area (e.g., a recreation project) may also attract firms anxious to tap the ready supply of labor or to take advantage of the local market.[3]

Conroy analyzes factors which have been germane to the shift of manufacturing industries:

> The regional shift of manufacturing to the South and West is related to transport cost factors that reduced the trend toward concentration. Industries that have relatively high freight costs have been less able to counter these costs with economies of scale from concentrated production and have been more responsive to the decentralization trend. The introduction of truck hauling and the generally greater advantages associated with short-haul trucking, according to Chinitz, have all tended to encourage the movement of plants closer to markets.[4]

It is therefore likely that the construction of the Interstate Highway System contributed in some measure to the lower transport cost factors and thus may have encouraged this shift.

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[1] Romans, J. T., and D. H. Garnick, "Evaluating National Efficiency and Regional Distributive Effects of Public Investment," Papers of the Regional Science Association, Vol. 28, 1972.

[2] Vaughan, op. cit.

[3] Ibid.

[4] Conroy, M., The Challenge of Urban Economic Development: An Evaluation of Policy Related Research on Alternative Goals, University of Texas at Austin, July 1974.

Leonard Wheat tested hypotheses relating regional manufacturing growth (a proxy for industrial location) to markets, labor supply, availability of natural resources, agglomeration factors, climate, "threshold influence" (the "hypothetical adverse effect to too much underdevelopment") and urban orientation. He found markets and climate to be "far ahead as the leading influences affecting manufacturing growth in the U.S.," followed by labor and threshold influences. Markets, in Wheat's analysis, reflected not a single factor but four related ones: absolute demand, measured by population and income (manufacturing employment growth is expected to be at least moderately proportional to growth in regional population); relative demand, as measured by per capita income (growth is expected to be more rapid where income is high relative to population); relative supply, represented by manufacturing employment per capita or per square mile; and spatial isolation, or the distance of the market from the Northeast manufacturing centers. Climate was held to be important since it affects migration, preferences of executives and professionals (who are assumed to be reluctant to locate in areas with harsh climates), and costs, which are assumed to be higher in colder areas due to higher heating bills and interruptions of construction activity.[1]

The results of Wheat's study have implications for public works investment policy, and particularly for government programs designed to accelerate regional economic growth by bolstering a region's assets and strengthening its urban infrastructure. Wheat found that virtually all the variation in regional growth can be accounted for by regional, rather than local influences, and that, therefore, efforts aimed at improving local (or urban) attractions will be ineffective. As for a regional growth policy, the factors which Wheat found to be most important in attracting manufacturing industry -- markets, climate, wages, and labor supply, threshold effects, resources and urbanization -- are not, in general, ones that are easily manipulated by a public works program, with the possible exception of markets. Wheat believed that the markets factors could be exploited by a program to increase demand through increased spending in the target areas, which a public works program would bring about, as well as manipulating the spatial isolation aspect of markets by increasing public investment in highways:

> Highways have promoted industrial decentralization by reducing short-haul transport costs vis-a-vis long-haul (rail) costs, thereby increasing savings that a company can realize through branch plants. New highways connecting hinterland manufacturing hubs with relatively nearby cities -- markets -- might spur further decentralization.[2]

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[1] Wheat, L., Regional Growth and Industrial Location, Lexington, Massachusetts, Lexington Books, 1973.

[2] Ibid., p. 116.

Public investment is expected to have beneficial impacts on regional economic growth not only as a means of attracting new industry to a region, but also by lowering costs to industries already located in the region through improved economic infrastructure, thus improving the region's comparative advantage which is expected to result in increased regional output, income and employment by increasing its level of exports.

North assessed the contribution of public works investment to regional growth in the context of export base theory (a form of regional demand theory). According to North, major developments in transport infrastructure, such as railroads and canals, lead to the growth of exports in a region, and thus increase output and income in that region. He also cites the role of the state and Federal governments in creating "social overhead benefits" which have created new exports in many regions; for example, the development of hydroelectric power in the Pacific Northwest resulted in the development of the aluminum industry there.[1]

The importance of government provision of public infrastructure to regional growth is often referred to in terms of the complementary nature of such investments -- the combined effect of investment in port facilities and transport linkages in the form of rail or highway connections will be greater than either investment taken singly -- and in terms of infrastructure as being a necessary condition for further economic development. This latter aspect of public investment was a major result of a CONSAD study of the regional effects of Federal procurement.[2] Its conclusion was the following:

> The economic, industrial and social infrastructure of an area set the stage for the area's economic pattern and policy. Broad scale artificial efforts to alter this activity will prove ineffective, unless, perhaps, these efforts are skillfully structured to take advantage of the regional infrastructure and resources, rather than attempting to counter them....It is clear that the main efforts of regional economic development planners must be concentrated on achieving improvement in the local infrastructure, through a wide variety of non-procurement activities.... (the study has shown)...that regardless of initial contract placement, ensuing activity tends to be performed in areas which possess the traditionally required industrial capacity. In other words, a good measure of the effects of procurement (indirect and first round consumption) will be lost to an area if certain necessary conditions, capacity or infrastructure do not exist there.[3]

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[1] North, D., "Location Theory and Regional Economic Growth," Journal of Political Economics, Vol. 63, June 1955, pp. 243-258.

[2] CONSAD Research Corporation, Regional Federal Procurement Study, prepared for the Office of Economic Research, U. S. Department of Commerce, October 1967, pp. 9.7-9.9.

[3] Ibid.

3.0 DEVELOPMENT IMPACTS OF PWI BY FUNCTIONAL TYPE

Little has been written on the impacts of public works investment on regional economic development. It was suggested in the previous chapter that different types of public works investment will result in different degrees of growth in key economic variables, depending on such factors as the previous level of the region's capital stock, level of unemployment and size of labor force, force account or bid status of the investment project, and skill requirements of the project. No comprehensive literature exists which investigates or documents the impacts on regional growth by functional type of public investment in detail, with two noteworthy exceptions: transportation investment (especially highways) and public investment in water resources. In the sections that follow, we will review a part of the literature regarding each category.

3.1 Impacts of Public Investment in Highways on Regional Growth

Transportation investment has played an important role in affecting industrial location and promoting regional economic development. These investments have provided improved access to raw materials, as well as intermediate and end use markets. Increased efficiency has accompanied the increased economies of scale and the greater level of regional integration resulting from lower transportation costs.

The early studies in location theory recognized the importance of transportation costs as one of the major determinants of industrial location.[1] While the importance of transportation costs has probably declined over time, there is evidence that major transport projects, such as the Interstate Highway System, have had significant impacts on the location of major industries. This section summarizes some of this evidence.

A study by Leonard Wheat has analyzed the effect of modern highways on urban manufacturing growth. Manufacturing growth rates were compared for two groups of cities, one within eight miles of an Interstate highway system and a second group consisting of cities more than 15 miles from a system. City pairs (one for each group in the analysis) were identified that were reasonably close to each other and have similar characteristics

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[1] Isard, Walter, Location and Space Economy, Cambridge, Massachusetts, The MIT Press, 1956.

(e.g., population). A total of 212 cities were chosen in the 48 contiguous states. The variable used for analysis was per capita manufacturing employment change over the 1958 to 1963 period.[1]

The results indicated that intercity highways stimulate growth in regions "where travel on regular highways is especially impeded by heavy traffic, frequent towns, and numerous hills and curves; that is, in regions with dense population and topographic irregularities."[2] The influence of highways tapered off with increasing distance and largely disappeared beyond a distance of ten miles from a highway. In particular, it was found that highways stimulate growth in cities with populations above 16,000 and with airline service. The results of the analysis are particularly significant given that it was carried out well ahead of the full completion of the Interstate Highway System.

The advantage of proximity to highways was particularly evident in the Southeast, East, Midwest, and Northwest. Among regions with dense population and hilly terrain, only the Northeast failed to respond significantly to highway availability,[3] except where the analysis was confined to larger cities.

While the study by Wheat focused on aggregate manufacturing employment as the dependent variable, other studies have analyzed the effect of transport availability at a more disaggregated level. One such study gave central importance to transport accessibility in explaining migration of people and location of industry.[4] The authors developed an econometric model for the 173 economic areas defined by the Bureau of Economic Analysis (BEA). The authors state:

> It has been our intuitive belief that the gradual completion of the Interstate Highway System has had substantially different impacts on the economic development of various parts of the nation....While low wage labor, inexpensive electricity, and other important resources have existed in the South for a long time, why has rapid

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[1] Wheat, Leonard, "The Effect of Modern Highways on Urban Manufacturing Growth," prepared for the 48th Annual Meeting of the Highway Research Board, January 13-17, 1969.

[2] Ibid.

[3] Lack of data precluded findings for the Rocky Mountain states and central or southern California.

[4] Olsen, R. J., et al., MULTIREGION: A Simulation-Forecasting Model of BEA Economic Area Population and Employment, Oak Ridge, Tennessee, Oak Ridge National Laboratory, October 1977.

> economic development only recently taken place? Have the Interstate Highways stimulated the region's economic development through increased access to the nation's highways.[1]

Interregional economic interdependence is included in the analysis by defining industrial access to markets through inclusion of truck transportation time from the metropolitan centers of one BEA area to another. These truck operating times for 1950, 1960, 1970, and projections for 1980 (by which time the Interstate Highway System is assumed to be complete) were used to define interregional "market potentials," both in terms of access to final demand, as well as intermediate markets.

In addition to the market potential variables, other variables hypothesized as being important in affecting industrial location include labor conditions, market competition, natural resources and amenities, as well as others. In using the model to analyze the determinants of recent changes in relative location, the results suggest:

> Interregional market size remains as the most important determinant of location change...followed by past activity/population density..., long term regional conditions ...and labor condition.[2]

In turn, truck operating time between BEA area urban centers was a kay variable in defining interregional market size.

While the two studies cited above give strong evidence regarding the importance of transport investment on regional development, there is little evidence to suggest that any additional mileage on the Interstate Highway System will continue to increase efficiency as rapidly as it has in the past. For example, a recent study by Harris Associates found that:

> After the completion of the Interstate Highway System, additional highway systems may add little to the efficiency of [the] nation's economy.[3]

Friedlander, in a study which applied benefit-cost analysis to the question of the desirability of the Interstate highway system, concluded that the substantial savings created by the project in the resources required for transportation outweighed its considerable cost. Such savings included both vehicular cost savings and inventory savings due

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[1] Olsen, et al., ibid.

[2] Ibid.

[3] Curtis C. Harris Associates, Inc., Evaluation of Regional Economic and Environmental Effects of Alternative Highway Systems, Final Report, prepared for the U. S. Department of Transportation, 1974.

to increased speed of shipment. Also considered were some of the indirect benefits, such as the externalities resulting from the widening of markets, stimulation of new investment opportunities, increased productivity of land due to its greater accessibility, and lower vehicular costs to drivers on other highways due to diminished congestion. However, in examining parts of the entire system, the author found that the urban interstate system (which handles mainly commuter traffic) appears to be the one which maximizes the stream of future income to society, while this is not the case with the rural interstate system. The author states:

> A detailed analysis that considers the true social benefits of the rural interstate system will indicate that its construction may not, in fact, be justified. The economically justified levels of traffic throughout the United States are probably insufficient to support such a large-scale capital-intensive system of highways...the benefits are too small to justify its cost.[1]

The author concludes, however, that since the gains from the urban system outweigh the losses from the rural system, the Interstate Highway System as a whole seems to be justified.

Bohm and Patterson hypothesized that population movements, and therefore interregional differences in economic growth, might be influenced by more efficient transportation, and tested by means of regression equations whether interstate highway location resulted in changes in county population. The conclusion was that the impact of the Interstate Highway System has been fairly substantial, with the strongest impacts in the South Atlantic, East South Central, West South Central and West North Central Census Regions.[2]

3.2 Water Resource PWI

3.2.1 Overview

The construction of the Erie Canal began in 1817 with assistance from the state of New York. The concepts behind the Erie Canal included the goal of national growth. National growth was stated in terms of

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[1] Friedlander, A. F., The Interstate Highways: A Study in Public Investment, Amsterdam, N. Holland, 1965.

[2] Bohm, Robert A., and David A. Patterson, "Interstate Highways and the Growth and Distribution of Population," presented at the American Statistical Association Conference, Fort Collins, Colorado, August 1971.

"opening up the West," a concept which was to endure to mid-twentieth century. The notion that public works projects would be profitable under perfect market conditions arose, followed by the idea that benefits to society which were "hidden" by market imperfections ought to be measurable.

Stopping floods has substantially more human emotional appeal than does building canals, so there was little need to attach implied profits to flood control measures. The amount of new land provided by flood control measures, however, did not have the quality of vastness implied in the concept of "opening up the West." It was necessary to assert that enabling specific river valleys to develop by providing flood control measures was beneficial to the nation as a whole.[1]

Robert Haveman has provided a detailed history of flood control efforts and their evolution into multi-purpose projects.[2] The major feature of most flood control projects was that they impacted on a specific, easily identified region (flood plain), but the concept of regional growth impacts did not achieve truly prominent stature until the connection between flood control and irrigation was made. Such a connection was not difficult.

In the 1960's, pollution became national in scope, and a national problem. Water resources PWI was a major factor in pollution control. The concept of low flow augmentation was already well developed by the early 1960's, and economists quickly developed the concept of costs borne by people who live downstream.[3] The control of water pollution became a nationwide phenomenon with the 1972 amendments to the Federal Water Pollution Control Act, and people realized that unlike dams, sewage treatment plants could be built anywhere, and that all of the cities would have to have them.

Water pollution control transcended regional competition at least temporarily. In the midst of conflicts between the Sunbelt and Frostbelt, water resource PWI provided a national program, and a job that had to be done.

3.2.2 Early Trends in Public-Private Relationships

The techniques of benefit-cost analysis and the use of benefit-cost ratios have been characteristic of public sector investments. Use of this technique began around the mid-twentieth century, and served to further

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[1] Schultze, Charles L., Setting National Priorities: The 1971 Budget, Washington, D.C., The Brookings Institute, 1970, pp. 165-166.

[2] Haveman, Robert H., Water Resource Investment and the Public Interest, Nashville, Tennessee, Vanderbilt University, 1965.

[3] Schultze, op. cit., p. 125.

formalize the divergent paths of public and private investment. Prior to 1900, there was less general concern about which sector was paying for public works. But regardless of whether these investments were public or private public works investment, their regional development impacts are still evident and regional development is still a major concept in benefit-cost analysis.

Charles W. Howe has commented on the historical role of one kind of PWI, water resource investment, in regional development:[1]

> Historically, water as an agricultural and industrial input and as a mode of transport was quite important in determining the pattern of economic development in the United States. It is unquestionably the case today that a continuation of some historical regional patterns of growth will depend upon a continual augmenting of regional supplies of water.[2]

This connection between the benefit-cost analysis of water resource PWI, on one hand, and the concept of regional development, on the other, was discussed in the Interagency Committee on Water Resources report:

> These intangible effects need to be described with care and should not be overlooked or minimized, merely because they are not susceptible of dollar evaluation. Intangible costs may involve such effects as the possible loss of a scenic or historic site in connection with a proposed dam. On the other hand, intangible benefits may in some cases embrace such effects as the strengthening of national security and regional economies through the encouragement of a more widely dispersed industry and the provision of opportunities for new homes, new investment, and new employment opportunities; and the provision of new avenues for the enjoyment of recreation and wildlife.[3]

Regional development as a concept incorporates dispersion of industry and opportunities for investment. These phenomena are called "intangible benefits," but if data on new investment could be collected and related to the past records of water resource investments, then these benefits would become intangible in an analytical sense.

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[1] Howe, C. W., "Water Resources and Regional Economic Growth," Water and Regional Economic Growth, pp. 477-489.

[2] Ibid., p. 478.

[3] Subcommittee on Evaluation Standards, Proposed Practices for Economic Analysis of River Basin Projects, Report to the Interagency Committee on Water Resources, Washington, D.C., U. S. Government Printing Office, May 1958, 1967-0263-733, p. 27.

The cost-benefit analysis approach is directed toward one or more specific projects. (The technique has in fact been extended to large-scale groups of projects, and to various public policy decisions.) Each specific project has one or more purposes which must be shown to be the basis for social benefits. Regional development in the form of increased investment or other growth indicators is viewed as a social benefit.

The Proposed Practices for Economic Analysis of River Basin Projects lists the following purposes of water resource projects:[1]

- Irrigation and other agricultural purposes;
- Flood control;
- Navigation;
- Electric power;
- Municipal and industrial water supply;
- Recreation, fish and wildlife; and
- Water pollution control.

These purposes have evolved over many years, from early navigation projects, through flood control projects, to finally include recreation and pollution control. Each purpose provides the basis for attributing social benefits to a specific PWI water resource project. Many regional development impacts (benefits) are attributed to more than one project purpose.

Benefits such as increased housing, employment, and income, for example, might be attributed to water supply, electric power, or navigation purposes. The impacts of water resource projects have been elaborated by many years of Congressional debate, Federal agency documents, and cost-benefit analyses. The specific variables which are impacted and the mechanisms of these impacts are numerous.

3.2.3 Changes in Concepts of Regional Development: The Four Account System

The analytical structure of water resource projects impacts became so complex that, in 1962, the U. S. Department of the Interior proposed the four account system.[2]

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[1] Subcommittee on Evaluation Standards, op. cit., p. vi.

[2] U. S. Department of the Interior, Bureau of Reclamation, Guidelines for Implementing Principles and Standards for Multiobjective Planning of Water Resources, Washington, D.C., U. S. Government Printing Office, 845-661, 1972.

The overriding consideration throughout plan formulation at all levels is to reflect societies' preferences for three major national objectives which are defined broadly as:

- National Economic Development (NED). Increase the nation's output of goods and services and improve economic efficiency.

- Environmental Quality (EQ). Enhance the quality of the environment by the protection, management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural or cultural resources and ecological systems.

- Regional Development (RD). Increase regional income and employment; distribution of population; improve the regional economic base and educational, cultural, and recreational opportunities; enhance environmental conditions of the region and other specified components.

The extent to which plans contribute either in a benefit or adverse way in serving the three objectives, as well as the impacts on social factors, must be evaluated to provide the means of appraisal of projects and programs or for comparing tradeoffs among alternatives. Thus, benefits and costs are to be evaluated either in monetary or non-monetary terms for these four accounts:

- NED Account. In monetary terms.

- EQ Account. In non-monetary terms.

- RD Account. In both monetary and non-monetary terms.

- Social Factors Account. In predominantly non-monetary terms.

The four account system extended the concept of regional impacts to encompass environmental and social variables, and it is proposed that regional development be composed primarily of "monetary evaluations," including employment and unemployment. The four account system did not emphasize private investment and its stimulation by PWI, as had been the case in the 1958 report to the Interagency Committee on Water Resources.

There are various possible interpretations of the shifting views toward private sector investment with respect to PWI. Some of these are discussed as "Legal, Social and Institutional Problems" in Senator Bellmon's report to the Committee on Appropriations of the U. S. Senate.[1]

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[1]Vieasman, Jr., W., and M. M. Simmons, "Water Resources - Their Regional Impact," in Selected Essays on Patterns of Regional Change, prepared by the Congressional Research Service, Gilbert Gude, Director, coordinated by B. Maffei and J. Mitrisin, Washington, D.C., U. S. Government Printing Office, 1977.

The common-property character of water has constrained implementation of efficient development, management and conservation practices. Changes in institutions such as property rights (water and land), organizational structures, and long-standing social customs would appear to be necessary to affect systematic changes on the scale required, but incremental changes could be made for new developments with minimal disruption of current policies and practices and even existing systems could be modified short of massive changes in water rights systems. For example, loans by Farmers Home Administration to finance private irrigation development could carry a restriction requiring that new facilities be designed and operated using the best available conservation practices. Difficulties to be overcome include:

- The lack of a comprehensive national water policy;
- The prevailing body of water law;
- The failure to recognize the interrelationship between surface and groundwater;
- The lack of appropriate institutions for managing regional and interstate water resources;
- The lack of incentives for generating widespread implementation of conservation practices;
- The failure to establish a price for water which is commensurate with the value of its use; and
- The pervasive "pump it today -- let tomorrow take care of itself" attitude.

The heart of the water resources issue is not technological but social, and therein lies the reason why solutions to water problems have been fragmented and of a patchwork variety, often avoiding the most rational and efficient means of resolution.

The increased focus on environmental preservation and enhancement has brought striking changes to traditional approaches to water resource developments. Old conflicts between users of water such as irrigators and manufacturers have been sharpened in the process and new conflicts between traditional users and conservationists have overshadowed many long-standing antogonisms.

The broad scope of regional development has not proven readily susceptible to measurement and analysis. As the technique of cost-benefit analysis have become more intricate, the difficulty of following the vision of regional development has increased. The problems related to measurement and analysis have not entirely determined the view toward PWI, private investment and regional development, but these problems have played a part. The difficulties were addressed by Michael F. Brewer,

Vice President of Resources for the Future, in an introduction to The Economic Performance of Public Investments, by Robert Haveman:[1]

> Over the years, a substantial literature has accumulated that deals with public investment in natural resources development generally and with water development projects in particular. The well-known 1950 report of the Federal Interagency River Basin Committee was one of the early economic contributions to the literature on project evaluation. The "Green Book," as this document has come to be known, presented the rationale for benefit-cost analysis to water development projects. It thus provided a base line for scholars, agency officials, and others who have tried to elaborate a theory and methodology for benefit-cost analysis as an instrument in resource development planning.
>
> Resources for the Future has participated in this effort to apply benefit-cost analysis to resource development. In 1957, RFF sponsored a study in which the concepts and methods of benefit-cost analysis were developed and applied in three case study situations. The resulting publication, Multiple Purpose River Development, by John Krutilla and Otto Eckstein, demonstrated among other things the sensitivity of cost and benefit estimates to assumptions about the cost of public capital, as reflected in the rates of interest used for discounting future benefits and costs. More recently, Robert Haveman and John Krutilla examined the adequacy of benefit-cost analysis for evaluating projects during periods of less than full employment in both the national and regional economies. In this study, Unemployment, Idle Capacity, and the Evaluation of Public Expenditures, Haveman and Krutilla presented a methodology for tracing the incidence of water development resource demands generated by regions and by the sectors of the national economy.
>
> In the present book, Robert Haveman extends this line of RFF work in an important dimension. His examination of the performance of a public project after it has been in operation deals with one of the weakest aspects of the planning process. Public resource development planning has been essentially a static extant activity. To be sure, the methodology and empirical planning factors

[1] Haveman, Robert, The Economic Performance of Public Investments, published by the Johns Hopkins Press for Resource for the Future, Baltimore, Maryland, 1972.

> have been improved over time, but few public resource agencies have developed procedures for monitoring the economic performance of the projects they have undertaken.[1]

The complexity referenced by Brewer is understated. Although Haveman's book holds to a very specific, logically connected analysis of regional impacts, the complexity encountered is suggested by diagrams of procedures used to analyze navigational projects.[2]

The measurement problem is further illustrated by Haveman's discussion of flood control projects. He suggests that improvements in productivity of land would be an appropriate PWI regional development impact measure:

> One of the outputs of a public flood control investment may be an increase in the productivity of floodplain land because of the reduced incidence of flooding. For example, because of reduced flood incidence, an entrepreneur may find it profitable to shift floodplain land from low-net-yield pasture to high-net-yield agricultural commodities or to a factory site. In principle, this output is the net reduction in cost (or increase in net earnings) experienced by the occupants of the land because of the flood reduction services of the investment other than flood damage reduction. In the water resource literature, the value of this physical output is known as "land enhancement benefits."[3]

Confronted by the problem of measuring land productivity, he then suggests that changes in land values would be a measure of change in productivity:

> Under a highly constrained set of conditions, changes in the land value of locations within the floodplain will capture: (1) the direct project benefits for crops and property damages averted; (2) the investment-induced productivity improvements (enhancement benefits) on land in the floodplain; and (3) the indirect primary benefits for cases (1) and (2).[4]

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[1] Ibid., pp. 45-57.

[2] Ibid., p. 19.

[3] Ibid., p. 19.

[4] Ibid., p. 22.

In carrying out his analyses, however, data on land values were projected from 1950 to 1969 and no actual measures of floodplain development after the PWI project are presented. A theoretical discussion of the analysis of land values is presented in an appendix to his book.

Another measure of the regional impact of flood control PWI is in terms of crops saved from destruction by floods. Both property and crop value changes are plausible measures of regional development impact, but their relation to a PWI project is dependent on the purpose of the project, e.g., flood control, and on the proximity of the property and farmland to the project location, e.g., flood control structure. Increases in crop values would be attributable to a hydroelectric project, for example, only if there was a complex sequence of mechanisms involving reduced farm production costs and/or increased regional demand for farm products.

Even in the analysis of hydroelectric projects in the Economic Performance of Public Investments, Haveman is constrained by data availability. The main impact of such projects is reduction in the cost of electric power, an impact which is plausible without complex attribution mechanisms, but which leaves many questions of regional development impacts unanswered. The time series data for small areas which would be needed to link a PWI project with regional development (housing, investment, employment) are still lacking.

In an earlier study, Haveman approached this problem from the opposite direction, by analyzing the regional employment changes due to large PWI projects. Using a Leontief intra-national model, calculations were made of the increase in output required of the industrial sector, and the income in labor cost of occupational category for each $1,000 of PWI, for each of ten regions.[1]

3.2.4 Development of More Sophisticated Measures of PWI Impacts

In addition to these regional impacts in terms of demands for specific sector outputs, Haveman and Krutilla estimated the capacity (of labor and capital) which will be "drawn in" to a PWI project of a given size, and which portion of this capacity will be from the unutilized component which exists in a less than full employment capacity. Of the total labor and capital used by a PWI investment, some portion is drawn from unutilized factors, and the rest is drawn from factors which would have been engaged in other productive activity.

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[1] Haveman, R. H., and J. V. Krutilla, Unemployment, Idle Capacity, and the Evaluation of Public Expenditures, published for Resources for the Future by the Johns Hopkins University Press, Baltimore, Maryland, 1968.

The two components of capital used are allocated according to rules developed by Haveman and Krutilla, and the shadow capital cost is the portion of capital drawn from other uses (Exhibit 3.1).[1]

In terms of regional economic development impact, the portion due to unused capital must be viewed as a growth impact. In addition, the diversion of capital presently in use is not necessarily a social cost, if the PWI project is viewed as correcting for market imperfections which are prohibiting the market from creating a demand for the PWI project. In fact, the degree of diversion of the private capital from other uses is possibly a measure of the impact of PWI in improving the efficiency of the regional economy.

It should be noted that the capital utilization analyzed by Haveman and Krutilla refers only to direct PWI project construction effects, not to large-scale effects generated or induced by the post-construction use of the PWI project. Thus, the sectors impacted by the PWI project, as identified by a Leontief intra-national model, are sectors related to construction in some way. The broader stimulation of investment in the region was not analyzed.

In addition to continuing emphasis on the use of cost-benefit techniques, a series of more comprehensive approaches for the analysis of water resource PWI impacts has begun to emerge. An example is the project conducted by the Department of the Army (Corps of Engineers) to develop a model for regional economic impact assessment of Army projects. The approach used is to develop an employment forecasting model which is sector-specific and which describes the impacts of certain types of sectors, e.g., export sectors, on other types. Such a model provides a direct way of analyzing not only direct effects of PWI construction, but broad effects of such phenomena as changes in the price of electric power and farm products.[2]

The report by Webster, et al., describes two types of economic impact models, the export base, location quotient (EB/LQ) model, and the input-output (I-O) model, both of which have drawbacks when implemented at the level of detail required to analyze regional development impacts of PWI water resource projects. These drawbacks arise from the erratic distribution of employment by sector when measured for small geographic units (e.g., counties), and the difficulty of conducting detailed surveys to ascertain interactions among sectors. Nevertheless, continuing emphasis on sector-specific impacts suggests that eventually, these drawbacks will be overcome.

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[1] Ibid., p. 79.

[2] Webster, R. D., et al., Development of the Economic Impact Forecast System (EIFS) - The Multiplier Aspect, Technical Report N-35, Report Number CERL-TR-N-35.

Exhibit 3.1: Total Money Capital Cost and Best Estimates of Shadow Capital Cost for the Twelve Project Types (in dollars per $1,000 of total contract costs)

Project Type	Capital Cost		Shadow as % of Money Capital Cost
	Total Money*	Total Shadow	
Large earth fill dams	119	111	94
Small earth fill dams	135	126	94
Local flood protection	109	103	94
Pile dikes	114	108	95
Levees	93	88	95
Revetments	157	151	96
Powerhouse construction	172	156	91
Medium concrete dams	121	111	92
Lock and concrete dams	159	147	92
Large multiple-purpose projects	112	104	93
Dredging	99	90	91
Miscellaneous	137	128	94

*The sum of the values of capital consumption allowance, net interest and corporate profits.

Source: Haveman and Krutilla, op. cit., p. 79.

Major difficulty still exists. Little attention is given, in recent work,[1] to utilization of capital, the variable identified by Haveman and Krutilla as an indicator of PWI projection of construction impacts. Other indicators, such as productivity outside the manufacturing sector, are rarely analyzed. Thus, a significant gap in developing a comprehensive model of PWI regional development impacts still exists. The most comprehensive structure for analysis of regional impacts of PWI is presented in the U. S. Department of the Interior Guidelines, but even here the lack of sophistication with respect to economic indicators is glaring.[2]

Efforts to develop a body of research on PWI impact indicators have been ongoing for many years. One example is the analysis by Haveman of net returns to ten southern states.[3]

Income redistribution, as analyzed by Haveman, is a plausible type of impact of PWI water resource projects, but interlinking this type of indicator with other complex indicators, and then connecting them to PWI water resource projects, and then integrating these links into an overall regional economic model has not yet been achieved.

3.2.5 Summary and Interpretation

In summary, this brief review of selected reports on regional development impacts of water resource PWI projects has identified a range of types of impact indicators from simple employment and project construction variables to complex, sophisticated indicators such as value-added, reduction of unutilized labor and capital, net returns on costs, and land productivity.

A few analytic techniques, including cost-benefit analysis and export base location quotient (EB/LQ) models were also reviewed. These techniques tend to be constrained by the unavailability of appropriate employment data. Additional conceptual work is recommended, which would improve analyltical capabilities by merging the better features of cost-benefit analysis, regional economic techniques, and river basin planning models.[4] Further work would then integrate existing sophisticated impact indicators, plus some new ones relating to economic efficiency, into the synthesized analytic technique.

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[1] See, for example, D. M. Roth, "Regional Employment Shifts and Wage Changes," and B. P. Berlin, "Trends in Industrial Location, 1954-1972," in Vieasman and Simmons, op. cit.

[2] U. S. Department of the Interior, op. cit., pp. 6-20, 6-23.

[3] Haveman, R. H., Water Resource Investment and the Public Interest, Nashville, Tennessee, Vanderbilt University Press, 1965.

[4] Schultze, C. L., op. cit.

APPENDIX D: RESULTS OF THE TELEPHONE SURVEY OF CAPITAL STOCK CONDITIONS AND RECOMMENDATIONS FOR CASE STUDY ANALYSIS

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	D.1
	1.1 Purpose	D.1
	1.2 Approach	D.1
2.0	DISCUSSION OF TWENTY-ONE CITIES	D.5
	2.1 Baltimore, Maryland	D.5
	2.2 Charlotte, North Carolina	D.7
	2.3 Cincinnati, Ohio	D.8
	2.4 Cleveland, Ohio	D.10
	2.5 Dallas, Texas	D.12
	2.6 Denver, Colorado	D.15
	2.7 Des Moines, Iowa	D.16
	2.8 Hartford, Connecticut	D.18
	2.9 Kansas City, Missouri	D.20
	2.10 Milwaukee, Wisconsin	D.21
	2.11 Minneapolis, Minnesota	D.23
	2.12 New Orleans, Louisiana	D.26
	2.13 Newark, New Jersey	D.28
	2.14 Oakland, California	D.30
	2.15 St. Louis, Missouri	D.31
	2.16 Savannah, Georgia	D.33
	2.17 Schenectady, New York	D.35
	2.18 Seattle, Washington	D.37
	2.19 Tucson, Arizona	D.39
	2.20 Tulsa, Oklahoma	D.41
	2.21 Worcester, Massachusetts	D.43
3.0	RECOMMENDATIONS FOR INTENSIVE CASE STUDIES	D.45

1.0 INTRODUCTION

1.1 Purpose

In order to perform in-depth, case study research into the maintenance, renovation and financing activities of cities, a two-stage process was designed. The first stage involved contacting a sample of 21 cities via telephone communications and other data-gathering activities. The intent was to try to obtain as broad a representation as possible concerning renovation, maintenance, and financing practices, as well as to provide a basis for selecting cities for in-depth field work in the second stage.

This appendix reports on the first stage of the sampling process and presents the results of an informal telephone survey with 21 cities across the country in order to ascertain the following:

- A brief summary of the condition of the capital infrastructure as characterized by streets and bridges, water supply and treatment, and wastewater collection and treatment;
- A general qualitative assessment of the infrastructure by local officials; and
- A listing of the local entity responsible for the administration and operation for each facility type examined.

The appendix also provides recommendations of cities to utilize for the intensive field work (case studies). Nine cities were selected; a discussion of the rationale for each city selected is provided in Chapter 3.0.[1]

1.2 Approach

This appendix utilizes the responses to questions which provided us with an understanding of the maintenance, renovation and financing activities of the city. The persons who provided the information are listed in the text for each city. The general categories of information which were requested centered on each city's public capital stock condition, capital improvement and maintenance programs, and revenue sources, for each of the above-mentioned functional categories.

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[1]Results of the city case studies are presented in Volume II of this study.

The selection of the 21 cities examined in this report was made in order to provide a broad representation of the following characteristics: region; age of city; fiscal condition; population; and type of local government entity that has responsibility for the capital stock.

Regional representation is divided among four broad Bureau of the Census regions: South; North Central; Northeast; West. The regional distribution is as follows:

Regional Distribution

South (South Atlantic, East South Central, West South Central)	North Central (West North Central, East North Central)	Northeast (New England, Middle Atlantic)	West (Pacific, Mountain)
Baltimore	Milwaukee	Newark	Seattle
Savannah	Kansas City	Hartford	Denver
Dallas	Minneapolis	Schenectady	Oakland
New Orleans	Cleveland	Worcester	Tucson
Charlotte	Cincinnati		
Tulsa	Des Moines		
	St. Louis		

City population (1975) is distributed as follows:

750,000-1,000,000	500,000-750,000	250,000-500,000	<250,000
Dallas	New Orleans	Kansas City	Savannah
Baltimore	Milwaukee	Minneapolis	Charlotte
	Cleveland	Cincinnati	Des Moines
	St. Louis	Newark	Hartford
		Seattle	Schenectady
		Denver	Worcester
		Oakland	
		Tulsa	
		Tucson	

The distribution of local entities responsible for the capital stock is categorized by: 1) cities that have a high degree of regionalization or joint responsibility for the capital stock (this is defined as those cities that have more than one infrastructure item administered jointly with other cities or a regional authority); and 2) cities whose capital stock is predominantly administered by the city government with no more than one infrastructure item jointly shared or regionalized.

Responsibility for Capital Stock

High Degree of Regionalization or Joint Responsibility	Predominantly City Responsibility	
Cleveland	Dallas	Savannah
Oakland[1,2]	Baltimore	Charlotte
Hartford[1,2]	Milwaukee	Des Moines[1]
Newark[1,2]	Kansas City	Schenectady
Seattle[1]	Cincinnati[1]	Tulsa
St. Louis[1]	Denver[2]	Minneapolis[1]
	New Orleans	Tucson
		Worcester[1]

The distribution according to age of the city is included to distinguish those cities whose capital stock is generally older from those cities whose capital stock is generally older from those cities whose capital stock has for the most part been recently installed.

The definition of city age which was selected is the last decennial period in which the average rate of population growth exceeds the national growth rate.[3] Three age groups were then devised: "Old" cities reached their growth peak between 1800 and 1870; "Intermediate" cities between 1880 and 1930; and "New" cities between 1940 and 1970.

Age of the City

Old	Intermediate	New
New Orleans	Hartford	Tucson
Baltimore	Kansas City	Oakland
St. Louis	Worcester	Denver
Cincinnati	Minneapolis	Des Moines
	Schenectady	Charlotte
	Cleveland	Tulsa
	Milwaukee	Savannah
	Newark	Dallas
		Seattle

[1]Regional sewer district.

[2]Regional water.

[3]This definition is from Alfred J. Watkins, Urban Development Within the U.S. System of Cities, unpublished Ph.D. dissertation, New School for Social Research, 1977.

The breakdown of cities according to fiscal condition is influenced by three factors: 1) problems in achieving consistently balanced operating budgets within the last five years; 2) evidence of emergency budgetary actions such as service cutbacks, personnel layoffs, or special tax increases -- in any one of the last five fiscal years -- in order to eliminate a temporary or prospective budget deficit; and 3) problems in gaining access to the credit markets within the last five years. These criteria are the basis for categorizing the fiscal conditions of the cities as follows:[1] weak fiscal conditions which would represent one or more of the above criteria; generally stable fiscal condition which represents a current position of budgetary balance but some experience with criterion number two within the last five years; and consistently strong fiscal condition in which none of the above criteria is existent.

Fiscal Condition

Weak	Generally Stable	Consistently Strong	
Cleveland	Cincinnati	Baltimore	Kansas City
Newark	Milwaukee	Tucson	Minneapolis
New Orleans	Seattle	Dallas	Charlotte
St. Louis	Hartford	Tulsa	Des Moines
	Oakland	Denver	

Also included in each report is the trend in capital expenditures as reported for each functional area by the Bureau of the Census, City Government Finances. This information is included to show the overall trend in capital expenditures and does not attempt to trace the sources of financing for such expenditures. Furthermore, data collected by the Bureau of the Census does not allow for the distinction of funds expended for new facilities, or for repair and replacement of old facilities. Annual expenditures of less than $100,000 for a particular function were not shown; however, they are reflected in the total. It should also be noted that the Bureau of the Census provides less detailed capital expenditure information for cities with populations of less than 300,000. Area and population density figures are derived from Bureau of the Census statistics.

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[1] Insufficient data for Savannah, Schenectady and Worcester made it difficult to classify them on the basis of this criterion.

2.0 DISCUSSION OF TWENTY-ONE CITIES

2.1 Baltimore, Maryland

Summary of Capital Stock Condition

For an older city, Baltimore's capital facilities are in good condition. The capacity of the water and sewer facilities are adequate to meet future demands and the current levels of service are quite high. Parts of the water distribution system date back to 1860. Tuberculation in large diameter mains does not present a problem although it has presented difficulties in some of the older small diameter mains. There is no systematic program for cleaning and lining of the large diameter main. Maintenance activities generally involve trouble-shooting such as leak detection and repair of broken mains and valves. Baltimore has an extensive watershed and reservoir network and its treatment facilities are considered to be adequate through the next 10 to 15 years.

The sewage collection and treatment system is in good condition. The treatment system is in the process of being upgraded which will give adequate capacity and treatment levels through the 1990's. Baltimore has separate storm and sanitary sewers totaling 2,780 miles. The condition of the pipe is good although extensive preventive maintenance is not performed. Maintenance activities generally constitute repair or upgrading of sewer lines.

Baltimore has replaced 30 bridges within the last 10 years, thus its bridge network is in good condition. Bridge maintenance, which basically comprises minor bridge repairs, was kept at constant levels in recent years.

Streets and highways are a problem area. Much of the road network is considered in poor condition. City officials estimate than an investment of $60 to $80 million will be necessary to bring the city's streets up to good standard. City officials claim that spending levels have not kept pace with needed repairs and rehabilitation. At the same time, in excess of $200 million was spent by the Federal government on construction of new Interstate highways within the city.

Contacts

Francis Kuchta, Director of Public Works	(301) 396-3100
Art Hilsanrad, Director of Capital Improvement Programs	(301) 396-4058

Responsibility for Capital Stock

Baltimore owns and operates all of the capital stock within its geographical limits with the exception of the Harbor Tunnel and mass transit facilities. Responsibility for the construction and maintenance of the major infrastructure systems has been centralized within the Department of Public Works. The department is responsible for public buildings, streets and bridges, garbage collection and disposal, repair and maintenance of machinery and equipment, operation and maintenance of control and water supply, and wastewater treatment systems.

Trends in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	38.2	59.3	76.5	122.6
Sewers	5.3	6.7	30.0	50.3
Sanitation	2.5	9.9	15.7	5.0
Water	3.2	9.7	6.5	9.2
Parks and Recreation	4.2	4.4	3.9	6.3
Housing and Urban Renewal	25.1	33.2	16.8	38.7
Public Buildings	.2	.4	--	--
Hospitals	1.9	1.2	3.1	1.0
Airports	.2	--	--	--
Parking	1.5	.8	4.0	2.3
Education	31.6	22.3	30.6	35.1
Other	7.9	13.6	19.0	15.7
Total	121.8	161.5	201.0	286.2
Capital Expenditures as a Percentage of Total Expenditures	15.8	20.5	20.8	25.8

Trends in Population

1960	1976	1975	Percent Change 1970-75	Percent Change 1960-75
939,000	906,000	852,000	-6.0	-9.3

Area Population and Density (1975)

72.1 square miles
11,568 per square mile

2.2 Charlotte, North Carolina

Summary of Capital Stock Condition

Charlotte is a relatively young, growing city and its capital facilities are in good shape. The water system is mostly of recent construction -- 50 percent of the main mileage is less than 15 years old -- and it is in good condition. Tuberculation is a minor problem because most pipe is lined and Charlotte's water is relatively pure. Water unaccounted for is ten percent of pumpage, indicating a minimal leakage problem. The capacity of the system will be fully used within five years, so additional treatment facilities are planned.

The sewer system is about the same age as the water system, and also is in good condition. Infiltration and inflow is serious enough to exceed the capacity of treatment facilities during storms, and the Utilities Department has requested $5 million to study and correct infiltration and inflow. While repairs to the sewers have made them less susceptible to infiltration and inflow in recent years, residential and commercial development has increased storm runoff flows and worsened flooding problems.

The city has an unusually thorough street maintenance program, with resurfacing on a 14 year cycle. Currently only eight percent of the street mileage under city responsibility needs resurfacing. Bridge maintenance is adequate and less than five percent of the bridges need major repairs or replacement. The majority of needed repairs are to correct functional obsolescence rather than deterioration.

In general, funding for maintenance and capital investment has been sufficient to maintain facilities. Only one sewer/water bond has failed since 1948, and the city is able to fund street maintenance from state gas tax receipts. In addition, 250 miles of streets and several bridges within Charlotte are maintained entirely by the state.

Contacts

Lee Dukes, Director of Charlotte-Mecklenburg Utilities Department	(704) 399-2221
Robert Hepson, Director of Public Works	(704) 374-2176
Robert Seals, Street Superintendent	(704) 374-2930

Responsibility for Capital Stock

The city is responsible for major capital facilities: streets, bridges, water, sewer, transit system and airport. The Engineering Division of the Public Works Department administers new construction and major repair contracts. The Street Maintenance Division maintains streets and bridges. Water and sewer service is provided by the Charlotte-Mecklenburg Utilities Department, a city agency.

Trends in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-1976
Highways	2.6	7.4	6.9	10.8
Sewers	2.4	3.5	6.4	7.1
Water	3.5	4.0	3.5	4.6
Public Buildings	5.8	1.1	--	.1
Housing and Urban Renewal	--	.8	3.8	4.0
Miscellaneous	10.0	12.0	11.2	9.1
Total	24.3	28.8	31.8	35.8
Capital Expenditures as a Percentage of Total Expenditures	37.5	38.8	34.8	34.8

Trends in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
202,000	241,000	281,000	+16.6	+39

Area and Population Density (1975)

76.0 square miles
3,173 per square mile

2.3 Cincinnati, Ohio

Summary of Capital Stock Condition

In general the condition of Cincinnati's capital facilities is good. However, the inability to finance major repairs and improvements because of limited bonding authority and recent fiscal pressure subject the city's capital facilities to more rapid deterioration in the future.

The water utility servies 900,000 in the metropolitan area through 3,850 miles of water main. Parts of the distribution systems are over 100 years old. Its overall condition is good as most of the large transmission main is lined and a large part of the downtown distribution systems has been replaced in the last 20 years. In older parts of the system greater amounts of funds are being expended for lead repairs and detection.

The sewer collection system is in good condition and, although it is old, collapses are very rare. A metropolitan sewage district collects

and treats wastewater for 700,000 customers. The treatment system has a designed capacity of 171 MGD and is already equipped with secondary treatment facilities. About 50 percent of the system is over 50 years old. In some of the older pipe, joints have been eroded thus causing serious infiltration and inflow problems. While the sewer facilities remain well maintained, greater investment in pipe replacement will be needed, particularly in the older parts of the system.

Many of the city's bridges are in poor condition due to rapid salt penetration. In 1977, 34 bridges were rated deficient. The city has responded with increased maintenance activity but further increases will be necessary to catch up with needed repair work.

The condition of the city's streets and highways is fair with many of the city's residential streets in need of rehabilitation or complete reconstruction. The exact mileage in need of improvements is not known as a survey of condition is not yet complete. The harsh winters of 1976-1977 and 1977-1978 caused accelerated deterioration in street conditions. Shortages of funding have caused street maintenance to lag. The public works department estimates that a $33 million investment to street reconstruction is necessary but such investment has been deferred because of a lack of capital funds.

Contacts

Kevin Shepard, Office of Research Evaluation and Budget	(513) 352-3232
David Smith, Highway Maintenance Division, Department of Public Works	(513) 352-4826
Dick Fahey, Metropolitan Sewer District	(513) 352-4826
Richard Miller, Cincinnati Waterworks	(513) 352-4641

Responsibility for Capital Stock

The Department of Public Works is responsible for most capital projects. Street and bridge maintenance is also performed by a public works division. The Cincinnati Waterworks, a city agency, supplies drinking water. Sewage collection and treatment are organized under a special district, the Metropolitan Sewer District. Sewer maintenance is performed by a city agency, the Department of Sewers.

Trends in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	1.8	2.1	3.3	3.6
Sewers	3.8	3.8	10.9	20.0
Sanitation	--	.2	--	2.9
Water	3.3	3.4	5.8	9.0
Parks and Recreation	3.5	4.2	5.6	8.1
Housing and Urban Renewal	6.4	4.3	11.2	9.6
Public Buildings	.5	.1	.2	.8
Hospitals	.5	2.0	2.3	2.0
Airports	--	.3	.6	.3
Education	27.1	18.2	14.5	13.0
Other	2.5	10.6	10.6	10.3
Total	49.4	49.1	64.9	79.0
Capital Expenditures as a Percentage of Total Expenditures	17.2	15.3	16.7	17.7

Trends in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
503,000	453,000	413,000	-8.8	-17.9

Area and Population Density (1975)

78.1 square miles
5,794 per square mile

2.4 Cleveland, Ohio

Summary of Capital Stock Condition

Cleveland has serious problems in three out of four infrastructure areas. The city's water system, with an estimated value of $600 million, is in a serious state of disrepair. Replacement of a major treatment plant and reservoir are critical needs which will cost close to $165 million. While treatment facilities are capable of purifying 645 MGD, the distribution system, plagued by tuberculated pipe, is only capable of delivering 500 MGD. According to the utilities director, more than 30,000 water meters need repair or replacement and over 1,000 fire hydrants await repairs. While over $150 million in capital improvements is required over the next ten years, so far few projects have been initiated with the

exception of cleaning and relining of 12 miles of pipe. In addition, over $20 million in water funds were "borrowed" by the city to cover general fund operating deficits.

Sewage treatment is provided by the Cleveland Regional Sewer District. A major capital improvement program is underway to replace one treatment facility, upgrade and expand two others. Over $300 million in Federal grant funds has been committed to date and CRSD expects to meet EPA NPDES permit requirements when construction is completed in the early 1980's. The city of Cleveland's contribution to these capital improvements is based on its percentage flow into the system. The collection system is administered by the city Department of Public Utilities and is composed entirely of combined sanitary and storm sewers. According to the 1976 EPA Needs Survey, the Cleveland SMSA has one of the highest per capita dollar figure ($345 per capita) requirements for repair and rehabilitation of sewer lines.

Sixty percent of the 210 bridges in the city are over 43 years old. According to the county engineer, 15 percent of these require extensive rehabilitation or replacement and another 19 percent, major repairs. The total cost of bringing bridges up to standard is estimated at over $200 million. Fortunately, the county is responsible for maintaining most of these bridges with the exception of the Terminal Tower Bridges which are the joint responsibility of the city and the railroads and require an estimated $7.5 million for repairs.

According to the Chief Engineer, Cleveland's streets are in relatively good condition due to a continuing street resurfacing program. Last year, 42 out of a total of 1,170 miles of paved roads were resurfaced with an asphalt overlay. Streets are inventoried every year and rated as to condition. The decision to resurface is based on this condition assessment, citizen complaints and political considerations.

Contacts

Joseph Stamps, Chief Engineer, Cleveland Department of Public Services	(216) 664-2000
Ronald Stackhouse, Chief Engineer, County	(216) 861-5211
Andy Unger, Cleveland Regional Sewer District	(216) 781-6600
Louis Corsi, Cleveland Department of Public Utilities	(216) 664-2000

Responsibility for Capital Stock

Cleveland has a mayor-council form of government. Responsibility for city streets and a few city-maintained bridges is lodged in the Department of Public Services. The Department of Public Utilities administers the water system and the sewer collection system. In recent years, responsibility for several city functions has been transferred

to the county. Bridges are largely the responsibility of the county. The Cleveland Regional Sewer District operates the area's sewage treatment facilities. In 1975, the Greater Cleveland Regional Transit Authority took over operation of the bus and light rail systems.

Trends in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	3.3	7.3	3.4	5.3
Sewers	11.7	12.5	6.4	3.8
Water	3.3	6.8	3.3	5.7
Sanitation	--	.2	--	--
Utility	2.6	1.7	1.2	2.9
Parks and Recreation	2.2	2.8	1.1	.5
Housing and Urban Renewal	2.3	2.5	4.9	9.3
Public Buildings	.8	.1	--	--
Airports	9.8	7.7	15.7	16.4
Miscellaneous	2.5	8.0	8.3	20.5
Total	36.9	49.6	44.3	64.4
Capital Expenditures as a Percentage of Total Expenditures	15.5	16.8	13.6	18.9

Trends in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-76
876,000	751,000	639,000	-14.9	-27.0

Area and Population Density (1975)

75.9 square miles
9,893 per square mile

2.5 Dallas, Texas

Summary of Capital Stock Condition

The condition of Dallas' major capital stock is generally excellent. The reasons for such favorable conditions are: 1) that much of the capital infrastructure is quite new and utilizes technological advances that were not available to older cities; and 2) that the city practices superior management of its capital facilities and very thorough maintenance practices.

Dallas' water system is in good condition in part because most of it is of fairly recent construction, but also because of a high level of maintenance and tightly enforced standards for new construction. There are minimal needs for rehabilitation or replacement of existing facilities as nearly half of the water mains are less than 25 years old. The major capital needs of the water system will be to meet the growing demands of an expanding population. While the city's water supply with a dependable yield of 440 MGD is considered adequate for about the next forty years, full utilization of these sources will require large investments in transmission lines and to upgrade treatment facilities to meet higher Federal drinking water standards.

The sewer system is generally well maintained and in good condition. In recent years infiltration and inflow and sewer line stoppages have been significantly reduced. Dallas' sewer system employs general innovative management tools in its preventive maintenance program including chemical control of roots and a computerized flow monitoring system which pinpionts the location of sewer main problems. Dallas is concluding a major period of capital investment in upgrading treatment facilities. As the improvements in the treatment facilities are completed, most of Dallas' future capital outlays will be for new sewer mains needed to accommodate the growing population.

The city's bridge network which includes 18 major bridges is in generally good condition. Within the last five years Dallas has engaged in a program of replacing functionally obsolete bridges whose roadways were too narrow for safe driving. Four bridges spanning the Trinity River are in need of improvements at an estimated cost of $20 million. Very few bridges have structural problems. Minimal amounts are spent on bridge maintenance.

Within the last 25 years Dallas has doubled its mileage of paved streets. A comprehensive evaluation of street condition is performed annually. At the end of 1975, over 75 percent of the total streets were in fair to good condition requiring some attention but not in need of resurfacing or major repairs. The severe winters of 1976-77 and 1977-78 have caused a backlog in necessary street maintenance. However, the city has historically performed high levels of maintenance and resurfacing, keeping the stock of the streets and highways in good condition. Maintaining Dallas' street and highway network in good condition continues to be one of the highest priorities of local officials and residents.

Contacts

John S. Murff, Street and Sanitation Services	(214) 670-8210
John Stacha, Dallas Water Utilities	(214) 670-3148
Jim Reames, Dallas Water Utilities	(214) 670-9711

Responsibility for Capital Stock

The city of Dallas is responsible for most elements of the capital infrastructure within Dallas with the exception of schools and hospitals. Street construction is administered by the Department of Public Works, maintenance by the Department of Streets and Sanitation. Dallas Water Utilities provides water and sewer services. It is a city department funded by its own revenue sources.

Trends in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	12.1	22.6	24.2	20.4
Sewers	7.7	13.5	26.3	6.4
Sanitation	--	--	2.2	--
Water	23.5	15.3	13.0	27.0
Parks and Recreation	16.5	19.6	15.3	7.1
Housing and Urban Renewal	--	--	--	--
Public Buildings	7.9	6.5	7.1	9.1
Hospitals	--	--	--	--
Airports	5.7	1.3	.2	--
Parking	--	--	--	--
Transit	3.7	2.4	4.2	2.8
Education	--	--	--	--
Other	6.1	4.1	9.8	7.9
Total	83.2	85.3	102.3	80.6
Capital Expenditures as a Percentage of Total Expenditures	34.7	32.1	33.4	25.5

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
680,000	844,000	813,000	-3.7	+19.6

Area and Population Density (1975)

265.6 square miles
3,179 per square mile

2.6 Denver, Colorado

Summary of Capital Stock Condition

The condition of Denver's capital facilities are excellent as a result of comprehensive maintenance programs and the relatively young age of the stock. Denver's only problem is the condition of some of its bridges which are in need of extensive repair or replacement.

The water distribution system consisting of over 1,800 miles of pipe is in excellent condition. Most of it is less than 25 years old. The city has an ongoing system of leak detection and for the past 8 years has had a program of cleaning and lining. While the city has adequate water services, its treatment facilities need new capacity. The city is in the process of getting a new treatment plant that will increase the city's capacity by 125 MGD. Over the next 10 to 15 years the major capital need of the water system will be to expand service at a cost of approximately $350 million.

Denver has a separate storm and sanitary gravity flow sewer system consisting of about 1,500 miles of pipe. The oldest parts of the system still in service exceed 70 years but the average age is less than 50 years. The condition of the pipe is good. Infiltration and inflow is not severe and pipe corrosion due to hydrogen sulfide concentration is not evident. Major capital needs will be to upgrade and expand the system. Upgrading would take the form of replacing much of the smaller pipe with large diameter pipe. The treatment facilities are considered to be in good condition and capacity is adequate to meet future demands.

Denver's streets are in good condition. Despite relatively severe winters, the city has been able to keep up a high level of resurfacing and repairs. Of the 1,680 paved miles, 85 percent are considered to be in good condition. Typically 70-90 miles of local streets are resurfaced annually. Arterials are resurfaced on 7 year cycles. City public works officials indicate that maintenance funds have been increasing. Denver's 7.8 miles of bridges comprising 70 structures are in need of improvement. Approximately $20-30 million will be needed to repair or replace 17 bridges in need of major repairs and 11 bridges are in need of minor repairs.

Contacts

Mr. Smith, Deputy Director of Public Works Department	(303) 575-3224
Mr. Zohn, Department of Wastewater	(303) 629-1451
Mr. Bill Miller, Denver Water Board	(303) 623-2500

Responsibility for Capital Stock

The Department of Public Works is responsible for the street and sewer system. A separate division within the Department of Public Works has direct responsibility for operations and administration of the sewer system. The Denver Water Board, which is an independent entity from the city government, is responsible for the operation and maintenance of the waterworks.

Trend in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	4.4	6.8	8.1	6.3
Sewers	.9	2.0	.9	2.8
Water	12.6	14.8	15.9	23.1
Sanitation	1.1	.5	2.2	1.7
Housing and Urban Renewal	11.3	10.5	10.1	4.6
Parks and Recreation	2.6	3.9	15.3	16.5
Hospitals	.5	.3	.4	.5
Public Buildings	.1	--	--	--
Airports	10.8	8.3	.2	18.2
Parking	--	--	--	7.2
Miscellaneous	5.0	10.1	18.4	12.2
Total	49.3	57.2	71.5	91.2
Capital Expenditures as a Percentage of Total Expenditures	17.9	19.2	21.2	26.8

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
494,000	515,000	485,000	-5.8	-1.8

Area and Population Density (1975)

95.2 square miles
5,406 per square mile

2.7 Des Moines, Iowa

Summary of Capital Stock Conditions

Des Moines is a medium-sized city with a slowly declining population. Its capital facilities appear to be in generally good condition, and officials believe current levels of maintenance to be adequate.

The water system appears to be in excellent condition, with only 8 percent of water unaccounted for and minimal needs for cleaning and lining or replacement. The waterworks emphasizes preventive maintenance -- for example, inspection and operation of all water valves annually.

The sewer system in Des Moines is partly combined, and more than half is greater than 50 years old. Stoppages and collapses occur regularly, but they are not at a level which officials consider a major problem. Inspection is performed on a five-year cycle. Sewer officials consider sewer performance and maintenance adequate.

Severe bridge corrosion was recognized as a problem in Des Moines 10 years ago, and since then 8 or 9 bridges have been rebuilt. Currently, only 2 major bridges have deficiencies, and these are scheduled for rehabilitation in the near future. Reconstructed bridges in Des Moines employ new designs much more resistant to salt corrosion than the older bridges. The most deteriorated bridges in the city now are the Interstates, which have corroded decks, although they are only 10-15 years old. Interstate bridges are a state responsibility. In spite of the substantial progress which has been made in correcting bridge problems, the Public Works Director believes more money is needed for bridge maintenance and repair.

Paved streets in Des Moines are in good condition, but 38 percent of the street mileage is unimproved, and these streets requiring oiling or stabilization on a three-year cycle. For paved streets, riding quality is maintained through an unusual preventive maintenance program which includes virtually no resurfacing, but extensive use of light coats of liquid asphalt on streets which have serious cracks. Seal coating and slurry sealing is performed on about a four-year cycle on paved streets.

Contacts

Dean Johnson, Water Works General Manager	(515) 288-2281
Leo L. Johnson, Director of Public Works	(515) 283-4276
Mr. Cook, Director of Sewer Maintenance	(515) 283-4950

Responsibility for Capital Stock

The Des Moines Public Works Department is responsible for street and bridge maintenance, with the exception of the Interstates. A Metropolitan Sewer District serves Des Moines and surrounding areas, and water is provided by the Des Moines Water Works, a city department under independent direction by a Board of Trustees.

Trends in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	3.9	3.2	6.5	8.9
Sewers	1.3	--	5.7	7.2
Public Buildings	.2	.5	.4	.3
Water	.5	.6	1.4	2.4
Housing and Urban Renewal	--	.2	.3	.8
Miscellaneous	1.9	5.6	7.3	4.9
Total	7.8	10.1	21.6	24.5
Capital Expenditures as a Percentage of Total Expenditures	17.6	19.6	33.4	35.3

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
209,000	201,000	194,000	-2.5	-7.2

Area and Population Density (1975)

62.3 square miles
3,174 per square mile

2.8 Hartford, Connecticut

Summary of Capital Stock Conditions

Hartford presents a variety of capital stock conditions. The general condition of the water works is good. The system is well maintained. While much of the distribution line is over 50 years old, leakage and tuberculation are not considered to be major problems. Water loss unaccounted for is less than 5 percent. The water supply is adequate to meet regional demand to at least the year 2030 and has a dependable yield of 52.2 MGD. The quality of the water is excellent because of a well protected watershed of 27,000 acres. Two water treatment plants provide slow sand and rapid sand filtration. Given the high quality of the water supply, the installation of a carbon filtration system is not needed at the present time.

The sewer system in Hartford is a combined storm and sanitary sewer, the major portion of which is over 70 years old. Although it is maintained reasonably well, under a regional authority, it is considered to be old and obsolete. Officials indicated that leaks and stoppages have

been increasing even with preventive maintenance activities. The principal problem will be to convert Hartford's combined system to separate storm and sanitary sewers. The costs for installing separate systems have been estimated to be as high as $500 million. The condition of the treatment facilities serving Hartford is good. The major plants have recently been upgraded to secondary treatment capability.

Hartford has responsibility for 14 bridges, four of which are in need of immediate attention. Required work ranges from complete replacement of one bridge to replacement of bridge deck on the others. The bridge maintenance budget has been recently cut back and maintenance expenditures are inadequate to keep the bridges from further deterioration.

The city's street network of 215 miles is in fair to poor condition. The combination of extreme weather conditions and lack of funding for maintenance have left approximately 20 to 30 percent of the city's streets in need of reconstruction and 40 to 50 percent in need of major repairs and resurfacing. City officials claim that the level of maintenance is not sufficient to improve the quality of the streets. The level of capital outlays for streets and highways has also been decreasing over time.

Contacts

Jack Sulick, Deputy City Manager	(203) 566-6620
Bernie Baticky, District Manager Regional Water and Sewer Agency	(203) 278-7850
Charles Button, Regional Water and Sewer Agency	(203) 278-7850

Responsibility for Capital Stock

The Department of Public Works is responsible for the city's streets, highway, and bridge network. A regional water and sewer agency is responsible for the operation and maintenance of the water supply and treatment facilities, and the sewerage collection and treatment facilities for the city of Hartford and 6 other municipalities. The costs of operations are met by user charges. Planning is done in conjunction with each municipality.

Trend in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Education	13.3	19.4	6.9	
Highway	.1	.3	.1	not
Housing and Urban Renewal	3.3	10.7	8.2	available
Other[1]	9.3	10.4	10.7	
Total[2]	26.0	40.8	26.0	

[1]Further breakdowns are not available

[2]Water and sewer are not included. They are the responsibility of a separate agency.

	1972-73	1973-74	1974-75	1975-76
Capital Expenditures as a Percentage of Total Expenditures	19.8	26.5	16.7	not available

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
162,000	158,000	138,000	-12.7	-14.6

Area and Population Density (1975)

17.4 square miles
9,081 per square mile

2.9 Kansas City, Missouri

Summary of Capital Stock Condition

The overall condition of Kansas City's major capital infrastructure items appears to be good. The older facilities such as the water and sewer system, which have parts older than 100 years, have been well maintained and provide generally high levels of service. The street and highway system is in good condition as a result of a comprehensive maintenance and resurfacing programs. Kansas City has, however, a large quantity of unimproved streets (approximately 600 miles acquired in recent annexations) that will require substantial levels of future investment to make necessary improvements. The city's bridge system is in fair to poor condition due to lack of maintenance and functional obsolescence and will require significant investment to bring the bridge network up to good standard.

Current capital investment plans are focused around improving the level of wastewater treatment to meet EPA requirements. These plans are not entirely consistent with the principal capital need which is to bring better services to recently annexed areas.

Contacts

Mayron Caulkins, Director of Public Works	(816) 274-1737
Don Boyd, Director of Water and Sewer	(816) 274-2376
Don Hurlbert, City Engineer	(816) 274-2565
Dave Maleck, Budget Analyst	(816) 274-1527

Responsibility for Capital Stock

The government of the city of Kansas City is responsible for the sewer collection and sewage treatment facilities, the water treatment

and distribution system, 2200 miles of streets, and 400 bridges. An Area Transportation Authority which operates separately from the city government provides bus service throughout the city.

Trend in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	4.5	4.1	5.0	7.2
Sewers	4.1	7.4	13.9	17.1
Sanitation	3.0	.6	.1	.2
Water	2.8	2.4	2.6	3.7
Parks and Recreation	1.8	7.0	17.3	14.9
Housing and Urban Renewal	5.3	5.3	.7	.6
Public Buildings	--	--	--	3.4
Hospitals	1.6	.2	--	--
Airports	21.5	7.4	2.2	3.0
Parking	--	--	--	--
Education	4.5	4.1	5.0	7.2
Other	.3	2.0	3.1	5.6
Total	49.4	40.5	49.9	62.9
Capital Expenditures as a Percentage of Total Expenditures	28.3	22.1	23.7	26.2

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
476,000	507,000	473,000	-6.7	-.6

Area and Population Density (1975)

316.3 square miles
1,603 per square mile

2.10 Milwaukee, Wisconsin

Summary of Capital Stock Condition

It would not be accurate to generalize about the overall condition of Milwaukee's capital stock, because each infrastructure item presents a variety of conditions. While 25 percent of the water distribution system is composed of pipe installed in 1874, the older pipe still provides reliable service. The principal trouble spot of the water distribution network is about 500 miles of pipes laid between World War II and 1963. These pipes are largely responsible for a doubling in water main breaks

since 1974. Increased levels of maintenance for pipe repair and a larger volume of main replacement will be necessary. In contrast to these conditions, Milwaukee has excellent sources of high quality water and, unlike many other cities, Milwaukee does not require additional investment in treatment facilities.

The sewer collection and treatment facilities present some serious problems. Three quarters of the city are serviced by separate storm and sanitary sewers and one quarter by combined sewers. The combined sewer system is subject to frequent overflow and will require substantial investment to correct this deficiency. The sewage treatment system operates very close to capacity and will require major expansion within the next 15 years. In addition, a court ordered ruling may require an investment of $1.5 billion to provide even higher levels of advanced wastewater treatment and correction of combined sewage overflow.

The bridge network is in poor condition requiring approximately $60 million in improvements and replacements over the next ten years. Harsh weather conditions and excessive use of road salt have contributed to the deterioration of the city's bridges.

Milwaukee's streets are in good condition as a result of relatively constant levels of street improvements and maintenance. Also a large part of the street network (one-fourth to one-third) is constructed of concrete which provides for a longer street life expectancy.

Contacts

Herbert Goetsch, Commissioner, Department of Public Works	(414) 278-3301
Edwin Laszewski, Chief Engineer (Streets and Sewers)	(414) 278-2400
Joel Wesselman, Metro Sewerage District	(414) 278-3958

Responsibility for Capital Stock

The city government, under the Department of Public Works, has eight bureaus which are responsible for streets, bridges, public buildings, the sewer collection system, traffic engineering, landscaping and municipal equipment. The Bureau of Waterworks operates as a self-sustaining entity. Sewage treatment facilities and the major interceptor mains which service the city are operated by a Metropolitan Sewage District.

Trends in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	8.9	9.2	12.9	10.6
Sewers	.2	5.3	5.4	6.6
Sanitation	.6	.3	.7	.7
Water	4.5	6.9	4.2	8.5
Parks and Recreation	7.3	7.0	4.7	3.5
Housing and Urban Renewal	3.2	12.4	6.9	7.8
Public Buildings	--	.9	1.0	.5
Hospitals	--	--	--	--
Airports	--	--	--	--
Parking	.7	.2	.1	.2
Education	--	--	--	--
Other	16.3	4.5	5.9	3.1
Total	41.7	46.7	41.8	41.5
Capital Expenditures as a Percent of Total Expenditures	20.2	20.4	18.3	17.3

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
741,000	717,000	666,000	-7.1	-10.1

Area and Population Density (1975)

950.0 square miles
7,548 per square mile

2.11 Minneapolis, Minnesota

Summary of Capital Stock Condition

The capital stock in Minneapolis is old and funds are insufficient to meet repair and replacement needs. Streets and highways are in fairly good condition. However, the condition of bridges is poor, and water and sewer systems need improvement. Minneapolis has a good, fairly detailed computerized inventory of all capital systems.

The Minneapolis water supply source is the Mississippi River. Minneapolis treats water for the city and some suburbs. A feasiblity study completed in 1978 determined that there is no ground water supplementary supply and that storage expansion will be necessary. Some

major repair and rehabilitation of the reservoir system is needed. For example, the original water reservoir treatment plant (constructed in 1911) needs major rehabilitation of the floor and ceiling at an expected cost of $1.5 million. The pumping station network is not adequate to meet either current or projected needs. Many pumps are vintage 1926 and 1930 and they are wearing out or have become obsolete.

There are 990 miles of transmission and feeder main in the Minneapolis water distribution system. The water distribution system began in 1867 to meet the needs of the milling industry and much of the system is old. Generally, most pipe in the system is cast iron; however, the newer larger mains are steel. Since the early 1950's, all pipes have been factory-lined and the city has been lining some of the large old lines. However, approximately 95 percent of the system is not lined. There is an approximate average annual water loss of 9-10 percent. However, the Fire Department and the Public Works Department use non-metered water for sewer and street flushing and water used in the treatment process or in the production of water is not metered. There is little main replacement because of shortages of funds.

Minneapolis has a water carriage sewer system which operates on a gravity system. 80 to 85 percent of the system is composed of separate storm and sanitary sewers and the remainder of the system is combined sewers. There is a total of 816 sanitary sewers and combined sewers. 67 of these sewers are under the jurisdiction of the Metropolitan Waste Control Agency. The system essentially began in 1883 and, except for modifications, was completed about 40 years ago. Approximately 50 percent of the system was built before 1910 and only about 5-10 percent is less than 25 years old. The system is primarily composed of clay pipe, brick sewers, or non-reinforced cement pipe. The sewer system is not adequate to handle stormwater runoff from the average storm activity. Minneapolis has had a preventive sewer maintenance program for about 10 years which has cut down on the number of sewer backups. Since the city is almost completely developed, it is expected that only a small amount of extension will be required. Only 4.4 miles of new storm drain and 1.25 miles of sanitary sewer pipe were installed in 1977.

Minneapolis has approximately 1,100 miles of streets. Approximately 60 percent of the system is in good or excellent condition. There is a Capital Improvement Program that began 15 years ago. Approximately 700 miles have been paved under this program during the 15-year period. The overall condition of bridges in Minneapolis, however, is poor, and a substantial amount of replacement is needed. Of the 165 bridges on the Federal Aid System, eight are structurally deficient and 41 are functionally obsolete.

Contacts

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Milt Christensen, Department of Public Works (Sewers)	(612) 348-2405
Jim Hayek, Department of Water Works	(612) 348-2418

Responsibility for Capital Stock

Minneapolis has a mayor-council form of government. The water and sewer systems are under the jurisdiction of the Department of Waterworks. Sewage treatment is handled by a metropolitan waste control district that services 100 municipalities in the Minneaspolis-St. Paul area. Streets and bridges are under the Department of Public Works

Trend in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	9.9	11.0	14.8	17.4
Sewers	11.5	1.7	2.8	2.3
Water	4.1	2.5	1.8	1.6
Housing and Urban Renewal	--	4.5	13.0	7.0
Parks and Recreation	3.6	9.6	7.9	12.3
Public Buildings	--	--	--	.2
Parking	--	--	2.8	5.4
Miscellaneous	1.4	5.2	7.0	5.2
Total	30.5	34.5	50.1	51.4
Capital Expenditures as a Percentage of Total Expenditures	22.2	22.9	27.9	26.3

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
483,000	434,000	378,000	-14.8	-21.7

Area and Population Density (1975)

55.1 square miles
7,884 per square mile

2.12 New Orleans, Louisiana

Summary of Capital Stock Condition

New Orleans has been characterized by local officials as a Northeastern city located in the South. With a declining population, an aging infrastructure and a deteriorating fiscal situation, the city has been unable to keep up with many of its capital spending needs. The proposed capital budget for 1979 is only $400,000 (local share).

The water system has adequate capacity to meet demand for the next five to ten years. Seventeen hundred miles of distribution main experience an average amount of leaks, minimal tuberculation problems and a fairly constant level of breaks concentrated in the older, 1908 vintage, cast-iron unlined pipe. The Board keeps records on the number of breaks and repair and replacement activity. Maintenance activities include a leak detection program.

New Orleans' sewer and water system, operating by an independent Sewarage and Water Board, does not appear to have major problems. When the East Bank sewage treatment plant opens in May of 1979, New Orleans will have four plants providing secondary treatment and meeting all EPA permit requirements. While infiltration and inflow has been identified as a major problem, it is evidently more cost/beneficial to treat the flow than to rehabilitate the system. Separate sanitary and storm sewers comprise the collection system. Adequacy of the storm water system to handle the area's extensive rainfall is a major problem. Maintenance involves TV inspection of the collection system, joint and manhole repair, and cleaning of storm water drainage canals.

The most recent survey of on-system bridges indicates that 22 percent of New Orleans' bridges are structurally deficient. However, many of the major bridges are under state jurisdiction and, thus, not the city's responsibility. The city estimates that the state should be spending about $10 million per annum on bridge maintenance. The city itself currently spends only $100,000-$150,000 per annum on such activities.

Streets have been labeled as the city's worst infrastructure problem. A condition inventory of all streets has been conducted, categorizing streets by type and paving surface characteristics. A quarter of the 1,600 miles of streets fall below minimum standards, requiring over $400 million for improvement. Spending on streets has been curtailed since 1978 when the city was unable to provide the local share for Federal-aid-urban funds. Community Development dollars have provided the major source of financing for street resurfacing activity. Maintenance expenditures have remained constant, but inflation has substantially eroded purchasing power.

Contacts

Jim Lewin, Capital Budget and Capital Improvement Program, Department of City Planning	(504) 586-4751
Blaise Carriere, Department of Streets	(504) 586-4513
Stuart Brehm, Sewerage and Water Board	(504) 586-4588

Responsibility for Capital Stock

New Orleans has a mayoral-council form of government. Responsibility for streets and bridges is lodged with the Department of Streets. The Sewerage and Water Board, an independent city authority with a separate capital budget, is responsible for the city's sewer and water system. Transit facilities are currently operated by a private utility -- New Orleans Public Service.

Trend in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	2.0	3.9	9.4	8.0
Sewers	4.0	5.9	3.6	17.0
Sanitation	--	1.1	2.1	1.4
Water	2.8	2.4	1.3	.7
Parks and Recreation	6.8	4.0	6.3	11.5
Public Buildings	--	.9	.3	3.4
Airports	9.5	13.8	4.9	3.3
Total	29.5	39.0	40.6	59.6
Capital Expenditures as a Percentage of Total Expenditures	18	21	19	22

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
628,000	593,000	560,000	-5.6	-10.8

Area and Population Density (1975)

197.1 square miles
3,011 per square mile

2.13 Newark, New Jersey

Summary of Capital Stock Condition

Overall, Newark's streets, water distribution system, and sewage treatment facilities are in a high state of disrepair. The condition of Newark's water distribution system is not good. The principal aqueducts servicing the city were constructed between 1886 and 1891; parts of the distribution system date back to 1840. Failures of the old cast iron pipe are becoming more frequent. Lack of maintenance has caused conditions where much of the old pipe remains badly tuberculated which has reduced the city's firefighting ability and results in the distribution of discolored water. It has been 10 years since any water pipe has been cleaned and relined. The water supply system leaves a large gap between maximum safe daily yield and the amount of water actually drawn from the city's reservoirs. Additional capacity is necessary, as well as rehabilitation of the supply aqueducts. City officials estimate that approximately $200 million in improvements to the water supply and distribution system will be necessary.

Newark's sewer collection system is predominately combined storm and sanitary sewers, parts of which date back to 1854. Eighty-five percent of the sewer system is between 50 and 100 years old. Lack of maintenance because of shortages of city funds have created conditions of excessive infiltration and inflow and frequent collapses. The wastewater treatment system in which Newark participates with other municipalities in the Passaic Valley is inadequate to provide secondary treatment. A planned investment of $500 million to equip the regional facilities with secondary treatment will be necessary.

State and county bridge officials indicated that Newark's 60 bridges were in fair to good condition. However, specific condition assessments and the number of functionally obsolete or structurally deficient bridges are not available without special examination of bridge records.

Seventy to eight percent of all roads are in some need of repair work from light resurfacing to major reconstruction. City officials estimate that to bring all of the city's roads up to good standard, an investment of roughly $200 million would be needed. The principal reason for the poor condition of the city's streets is inadequate levels of maintenance and repair. Very simply, the city has not been able to provide enough funds to keep its roadways in good condition.

Contacts

Vince Toma, Director of Public Works	(201) 733-6303
Al Zach, City Engineer	(201) 733-8051
Tom Weingarten, City Engineer	(201) 733-8077
George Schmidt, Water Department Engineer	(201) 733-6313
Bob Benn, Sewer Department Engineer	(201) 733-6683

Responsibility for Capital Stock

Newark has a decentralized system of management for its capital infrastructure. The city water department operates and maintains a treatment and distribution system. Other treatment facilities are administered by two county entities for which Newark is apportioned an annual share of the cost of operations. Part of its supply system is administered by a commission which maintains 35,000 acres of watershed property. Newark receives another part of its supply from the Elizabethtown water works. The sewer collection system is a city function but sewage treatment is shared with the Passaic Valley Commission and the Essex-Union Joint Meeting. The street and highway system and the city-owned bridges are operated and maintained by the public works department.

Trend in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	.9	--	.1	.3
Sewers	.2	.2	.3	--
Sanitation	.6	.6	.8	.8
Water	.5	.8	.4	.8
Parks and Recreation	.6	1.2	.8	1.1
Housing and Urban Renewal	3.4	--	3.3	9.7
Public Buildings	--	--	--	--
Hospitals	--	--	--	--
Airports	--	--	--	--
Parking	.2	--	--	--
Education	6.0	13.2	10.9	8.7
Other	1.9	3.4	3.2	4.2
Total	13.8	19.4	19.8	25.6
Capital Expenditures as a Percentage of Total Expenditures	5.0	6.5	6.1	7.2

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
405,000	382,000	340,000	-11.0	-16

Area and Population Density (1975)

23.5 square miles
16,273 per square mile

2.14 Oakland, California

Summary of Capital Stock Condition

Oakland is experiencing problems in many of the infrastructure areas under city jurisdiction: streets, off-system bridges, and the sewer collection system.

The water and sewage treatment facilities which are operated by a Special District are relatively problem-free. Water supply is adequate and East Bay Municipal Utility District has an excellent preventive maintenance program for the distribution system. The District has an annual replacement schedule for 30-40 year old cast iron pipe in the city of Oakland. Decisions concerning pipe replacement are based on the number of breaks as well as on the adequacy and reliability of flow for fire fighting purposes. The one sewage treatment facility has recently been upgraded to provide secondary treatment and, thus, meets EPA effluent requirements.

The sewer collection system, also under city jurisdiction, has serious problems. A recent infiltration and inflow study for the city of Oakland identified illegal connections from one out of every ten households. Inflow is also a serious problem. City capital improvements are financed by user charges. Since the city council, however, has not approved a rate increase since 1968, the Office of Public Works has been operating on a skeleton budget ($150,000 as opposed to a desired $700,000 for capital improvements) and has abandoned any preventive maintenance efforts.

Oakland's bridge problem appears to be confined to off-system bridges. Out of a total of 145 on-system structures, none is structurally deficient and only 4 are functionally obsolescent. In contrast, the off-system bridges, which are under city jurisdiction, do not receive systematic inspection or maintenance.

There are 778 miles of city streets, 42 of which are unimproved. Oakland has a 15 year plan for capital improvement of the street system, but public works' officials indicate that the city is already several years behind in meeting planned expenditures. Recently, the city has been using Community Development funds to provide the local match for Federal-aid-urban-funds allocations.

Contacts

Ron Hurlbut, Acting Deputy Director, Office of Public Works	(415) 273-2962
Karl Stinson, Associate Environmental Engineer, East Bay Municipal Utility District (Water)	(415) 835-3000
Dan Wilkowsky, Engineer, East Bay Municipal Utility District (Sewer)	(415) 465-3700

Responsibility for Capital Stock

Oakland has a city manager-council form of government. The Office of Public Works has responsibility for city streets, off-system bridges and the sewer collection system. The state has responsibility for on-system bridges. A special district -- East Bay MUD -- operates sewage treatment facilities and the water system for Oakland. The district has its own Board of Directors and budget, and finances improvements partially by user charges.

Trends in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	5.7	3.4	4.9	4.3
Sewers	.9	.9	1.8	.8
Housing and Urban Renewal	7.7	8.5	4.0	7.7
Parks and Recreation	.6	1.0	.5	1.6
Airports	8.7	2.5	4.4	2.3
Miscellaneous	10.8	7.4	7.5	25.6
Total	34.4	23.7	23.1	42.3
Capital Expenditures as a Percentage of Total Expenditures	27.3	19.8	16.5	23.5

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
368,000	362,000	331,000	-8.6	-10.1

Area and Population Density (1975)

53.4 square miles
6,711 per square mile

2.15 St. Louis, Missouri

Summary of Capital Stock Condition

St. Louis appears to have very serious difficulties in maintaining capital facilities at an acceptable standard. Most facilities are very old, and local resources are insufficient to reduce the backlog of needed repairs and replacements.

The water system is old and in poor condition. A $15 million capital improvement program comprised entirely of repair and rehabilitation projects is currently delayed because revenues are insufficient to finance it. Downtown water mains are over 100 years old, tuberculated, and corroded because of electrical currents in the past generated by trolleys. Officials are concerned that the poor condition of the downtown water system is hampering the ability to contain major fires. Leakage is estimated at 15 percent. The level of maintenance is inadequate: water system personnel has been reduced by 120 persons over the last 10 years. Cleaning and lining are performed on only 1 to 2 miles of mains annually. The past two severe winters doubled the number of water main breaks.

The sewer system is also old and performing poorly. All of the St. Louis sewers are combined storm and sanitary sewers, and storm flow regularly exceed the capacity of treatment facilities. Over 90 percent of the St. Louis system is greater than 50 years old, and sewer collapses and flooding are regular and increasingly common events. Suits for property damage are increasing and present a major problem for the Metropolitan Sewer District. Repairs and cleaning are confined to those sections of the system creating serious problems. About 100 to 120 miles of main are cleaned annually, a cleaning cycle of 50 years.

Bridges are a major problem. Of 55 bridges maintained by the city, 50 are deficient, most of these requiring very extensive repairs. Currently, maintenance is limited to emergency repairs, because of a lack of funding. One bridge has been closed to traffic, and 5-6 are scheduled for replacement. Most bridges are from 60 to 80 years old.

The streets are in poor condition. Officials estimate that 100 miles per year (nine percent of city-jurisdiction mileage) must be rehabilitated or resurfaced to correct current deficiencies. In the last two years, the city has resurfaced at this rate with the aid of Federal local Public Works Funds and Community Development Block Grant money. Without Federal assistance, the city can resurface only 20 miles per year, according to the Street Commissioner. In addition, St. Louis still has some unimproved streets which are being reconstructed and upgraded.

Contacts

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Stanley Fletcher, Water Commissioner	(314) 453-4213
Tom Heugle, Street Commissioner	(314) 647-3111
Larry Unland, Director of Public Works (not contacted)	(314) 453-3011

Responsibility for Capital Stock

All major capital facilities, with the exception of sewers and schools, are the responsibility of the city. The sewer is part of a Metropolitan Sewer District. Facilities provided by the city include hospitals, health centers and an airport. The water system is maintained by the Water Division of the Department of Public Utilities.

Trend in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	6.4	2.8	3.6	2.7
Sewers	--	--	--	.2
Water	2.7	.6	.7	.7
Sanitation	--	--	--	.2
Parks and Recreation	.5	5.2	10.1	14.4
Hospitals	1.6	2.2	1.0	.5
Airports	3.5	2.3	5.3	5.6
Parking	1.5	--	.3	--
Miscellaneous	3.6	6.0	4.1	3.8
Total	19.8	19.1	25.1	28.0
Capital Expenditures as a Percentage of Total Expenditures	9.5	8.6	10.1	10.4

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
750,000	622,000	525,000	-15.6	-30.0

Area and Population Density (1975)

61.2 square miles
10,167 per square mile

2.16 Savannah, Georgia

Summary of Capital Stock Condition

Savannah's capital facilities are in good condition as a result of generally high historical levels of routine maintenance and favorable geographical and climatic conditions.

The water distribution system consisting of approximately 350 miles of pipe is in good condition. The oldest parts of the system date back to the late 1890's and provide generally high levels of service. Tuberculation is not considered to be a problem. Leakage is not serious although there are 13 miles of pipe that have significant exterior corrosion. While no systematic program of preventive maintenance exists, routine maintenance is performed when problems arise. As a matter of policy, necessary maintenance is not allowed to accumulate. The major capital need is to build more elevated water storage tanks. Because the city is on level ground, water pumping costs are quite high. Construction of more elevated tanks would help to reduce these costs. A $3.5 million rehabilitation of Savannah's 52 MGD treatment plant is currently underway. The system has about a 50 MGD capacity and average daily consumption of 25 MGD.

The sewer system is in good shape as over $30 million was recently invested in a separate sewer system. There are a few problems as a result of the city's flat terrain. Hydrogen sulfide concentration and resultant corrosion affect about 30 percent of the pipe. Also, the system has many hydraulic lift stations which are a maintenance headache because they have so many moving parts. Lift stations will be modernized at the rate of two to three per year. Infiltration and inflow are evident in portions of the pipe that are below the water table where joints rot out more quickly. City officials estimate that about $6 million would be needed to correct infiltration and inflow. The treatment facilities are in good condition, all plants provide secondary capacity and NPDES standards are being met.

The precise number of bridges that Savannah is responsible for was not ascertained. However, there are three bridges in need of major repairs and replacement and eight more suspected of needing a variety of improvements. In general the City Engineer claims that most of the city's bridges are in good shape.

Savannah's 260 miles of paved streets are in excellent condition. Only 15 percent are considered to be in need of resurfacing or reconstruction. Crack filling and pothole repair is done by the city but, recently, a state program provides for resurfacing. In the past year, 22 miles of streets were resurfaced by the state. The major capital need will be to pave approximately 70 miles of Savannah's unpaved streets.

Contacts

Al Hansard, City Engineer	(912) 233-9321
John Knuckel, Water and Sewer Department	(912) 233-9321, ext. 361
Henry Nanninga, Senior Civil Engineer	(912) 233-9321
George Chandler, Division of Street Maintenance	(912) 233-9321

Responsibility for Capital Stock

All capital facilities are under the jurisdiction of the city government. The Water and Sewer Department is responsible for the operation of these facilities. Planning is done in cooperation with the Water and Sewer Department and the City Engineering Department. The street maintenance division is resonsible for pothole filling, cleaning, crack sealing, and utility cut repairs. Resurfacing is done by contract with the state.

Trend in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	6.6	.9	1.2	.2
Sewers	.5	1.2	.2	.3
Water	.4	15.0	6.2	--
Miscellaneous	1.2	1.6	3.9	4.5
Total	8.7	18.7	11.5	5.0

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
149,000	118,000	110,000	-6.8	-26.2

Area and Population Density (1975)

26.8 square miles
4,416 per square mile

2.17 Schenectady, New York

Summary of Capital Stock Condition

Despite relatively old capital infrastructure, Schenectady has managed to keep its overall capital stock in good condition. The city's waterworks are in good condition. The average age of its 200 miles of pipe is 65 years. Leakage and main breaks are not considered to be problems. Excessive pipe deterioration is not evident. Maintenance expenditures have been relatively constant but city officials believe that greater maintenance expenditures will be needed. The city is beginning a major program of cleaning and lining which will prolong the useful life of the older pipe. Schenectady has one treatment plant providing chlorination and fluoridation. The water supply which is drawn from deep wells provides very high quality water. At present a carbon filtration system is not planned.

Schenectady has a separate storm and sanitary sewer system which dates back to 1880. The overall condition is good. Breaks have been relatively constant at eight to ten per year and are primarily confined to the very old pipe. The city is in the process of applying for funds to study infiltration and inflow which is believed to be somewhat of a problem. Maintenance activities have decreased somewhat because of manpower shortages. City officials feel that not enough money is spent on cleaning. TV equipment was recently purchased so that maintenance funds can be allocated more precisely to parts of the system with the greatest need. Schenectady has a 20 MGD treatment plant that was recently upgraded for secondary treatment. It is in excellent condition and its capacity is adequate to meet future demands.

Schenectady has two main bridges under its jurisdiction, one is in the process of being replaced. The other which is structurally deficient is in need of major rehabilitation at an estimate cost of $500,000.

The city's street and highway network of 184 miles, paved and unpaved, is in very good shape with less than 18 miles in need of reconstruction and only 15 miles in need of resurfacing. Relatively constant levels of repair and maintenance are responsible for the good condition. For the last twenty years between five and six miles have been resurfaced annually.

Contacts

Mr. Goodreau, Director of Public Works	(518) 382-5082
Mr. Caputo, City Manager	(518) 382-5000
Mr. Lilky, Water Department	(518) 382-5023

Responsibility for Capital Stock

The city government is responsible for all the infrastructure. The Public Works Department handles streets, highways, bridges, and sewers. A separate Water Department is responsible for water supply distribution and treatment.

Trend in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	--	.2	--	1.4
Sewers	1.2	6.7	--	--
Housing and Urban Development	1.8	1.4	1.4	.7
Water	--	.1	--	--
Miscellaneous	1.5	1.3	.3	.4
Total	4.5	9.8	1.7	2.5
Capital Expenditures as a Percentage of TotalExpenditures	25.7	38.0	8.7	10.9

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
81,682	77,859	74,995	-3.6	-8.1

Area and Population Density (1975)

10.3 square miles
7,134 per square mile

2.18 Seattle, Washington

Summary of Capital Stock Condition

The general condition of Seattle's capital stock is good; water and sewer systems seem to be adequate to meet current and projected needs for the next 10-15 years, and over 50 percent of the streets and highways have a fair-good condition rating. The Seattle water distribution system began in 1870. Seventy-five percent of the pipe is over 25 years old and 50 percent of the pipe is over 50 years old. There is a 15 percent water loss per year and 1,500 customer service connections and mains are repaired each year. Tuberculation is a problem, and it is primarily caused by the corrosive water in Seattle. Approximately 3.96 miles of main were put into the system in 1977. This is a combination of new main and replacement. Although there is rapid growth in the area, the Seattle water system is not expanding quickly because there is a tendency for people to be conservation conscious, and this has reduced or slowed down the need to increase capacity.

The Seattle water supply comes from two rivers, and the city has three primary reservoirs, 12 distribution reservoirs, three primary treatment facilities, and 11 secondary chlorination facilities and about 27 pumping stations. Because Seattle's water is pure, it is only treated with chlorine and fluoride. The water supply system is adequate to meet current and projected demand for the next 10-15 years, but there will be some expansion. Seattle is currently doing some fairly major maintenance and updating of its secondary reservoirs. The expected cost of these repairs is approximately $88 million.

A large part of the sewer system consists of pipe that is 40, 75, or 80 years old. The large trunk lines are quite old and are constructed with brick. Some of the oldest pipe is made of clay. In the early 1970's Seattle conducted a major renovation of the sewer system. About $65 million was spent largely on separation of the storm and sanitary requirements. As a result of the renovation, a lot of backups were eliminated.

Since 1964, the interior condition of sewer pipes has been monitored by a TV inspection system which enables the city to identify and repair structural weaknesses before they develop into major problems. TV inspection and a strong preventive maintenance program were initiated in response to the Revena sewer break disaster in the late 1950's when a six foot tunnel buried 135 feet deep collapsed causing an enormous amount of flooding and about $3.5 million worth of damage. The major problems with sewer pipes in Seattle are not just age and normal wearing out, but the fact that they are also subjected to earth stress and settlement. The inspection and preventive maintenance is working well. There has been only one major breakdown in the last 6-10 years.

The weakest part of the system seems to be bridges, which are deteriorating faster than the city can repair them. Seattle has 300 bridges, of which 188 are on the Federal Aid System. Six bridges are considered functionally obsolete, and one is structurally deficient. Eight bridges are in need of major repairs consisting of widening, replacement, or construction of new bridge deck. Twenty-one bridges are in need of minor repairs.

There are 1,690 miles of street in Seattle. One thousand one hundred sixty-five (1,655) miles are under the jurisdiction of the city and 35 miles are under the jurisdiction of the state. The city maintains a street inventory which includes the number of street miles broken down by surface type and street category, as well as data on guard rail, sidewalks, curbs, gutters, and alleys. However, current condition assessments are not included. The annual inspection of street condition is fairly informal and determination of which streets need resurfacing is based on citizen request and the report of district foremen. There is also a five-year program to review all asphalt streets over 30 years old that have not been resurfaced. Resurfacing funds in 1977 and 1978 came primarily from the Federal-Aid-Urban-System (F.A.U.S.) and the city did not resurface any streets not on the F.A.U.S. system. Generally, most residential streets are considered to be in fair-good condition, but many arterials and downtown alleys need to be resurfaced. To discourage driving downtown, Seattle has recently widened downtown sidewalks and narrowed downtown streets. In 1977 and 1978 the amount of mileage resurfaced was less than it had been in recent years because the price of asphalt rose. Thus, it now costs more to resurface less.

Contacts

Jesse Ramey, Water Works Department	(206) 625-4146
M.D. Hilyard, Department of Engineering (Streets)	(206) 625-2391
Bonnie Mattson, Metro. District (Sewer)	(206) 447-6670

Responsibility for Capital Stock

Seattle has a mayor-council form of government. A Board of Public Works is responsible for the city's street and water departments and bridges. The Municipality of Metropolitan Seattle provides sewage collection and treatment for King County.

Trend in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	11.2	12.1	15.8	16.0
Sewers	12.6	11.4	13.3	6.7
Water	7.0	2.1	1.9	2.6
Sanitation	--	.1	.2	.7
Parks and Recreation	6.7	10.3	9.5	9.5
Housing and Urban Development	3.0	4.9	7.0	1.1
Miscellaneous	4.8	4.2	4.2	3.8
Total	45.3	45.1	52.0	40.4
Capital Expenditures as a Percentage of Total Expenditures	17	16	17	14

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
557,000	531,000	487,000	-8.3	-12.6

Area and Population Density (1975)

83.6 square miles
6,350 per square mile

2.19 Tucson, Arizona

Summary of Capital Stock Condition

Tucson's capital stock is in good condition, primarily because most of it is less than 25 years old.

The condition of the water supply system is excellent and the water supply does not require extensive treatment. Expansion of the water supply is necessary and the city is engaged in a $100 million program to do so.

The sewer collection system is in excellent condition and has very low levels of line breaks and stoppages. Preventive maintenance programs have been abandoned in recent years because the sewer line is in such good condition. The city will spend $28.5 million to equip its sewage treatment facilities with secondary capacity in order to meet EPA requirements.

The street and highway system shows 50 to 60 percent of the total mileage to be in good condition and less than 25 percent in need of major resurfacing or reconstruction. All of the city's bridges are less than 20 years old, are in excellent condition, and require minimal maintenance.

Contacts

Frank Emitt, City Engineer	(602) 791-4251
Tom Mundinger, Department of Water and Sewer	(602) 791-4331
Eric Ynancst, Department of Water and Sewer	(602) 791-4331
James Kay, Finance Director	(602) 791-4204

Responsibility for Capital Stock

The government of the city of Tucson is responsible for the operation and maintenance of its street and highway and bridge network, sewer collection and treatment, water supply, distribution, and treatment. Parts of Pima County are serviced by Tucson's water supply system and some of the county's sewage is treated by Tucson's plants.

Trend in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	2.2	7.4	4.9	2.0
Sewers	1.7	2.6	1.0	1.6
Water	9.2	4.5	10.2	14.6
Housing and Urban Renewal	2.6	2.5	4.1	1.3
Public Buildings	1.7	1.6	--	--
Other	4.6	12.4	18.0	15.6
Total	21.8	31.0	38.2	35.1
Capital Expenditures as a Percentage of Total Expenditures	34.1	34.5	37.8	35.4

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
213,000	263,000	296,000	+12.5	+39.0

Area and Population Density (1975)

80 square miles
3,287 per square mile

2.20 Tulsa, Oklahoma

Summary of Capital Stock Condition

Overall, Tulsa's capital stock is in good condition. The street and highway system in Tulsa is above average. Eighty-five percent of the system is rated excellent or good. The sewer and water systems need increased investment in order to consistently meet current standards and projected needs.

Tulsa has two major water supply sources, two raw water reservoirs, nine treated or finish water reservoirs, two treatment facilities, two primary pumping stations and six secondary pumping stations. The treatment facilities were constructed in 1922 and 1973. The last modification of the 1922 facility occurred in 1975. The treatment includes the addition of alum to take out impurities, filtration of the water and chlorination to disinfect the water. Neither the water supply system nor the pumping station network are adequate to meet the projected demand for water over the next 10 to 15 years and the city has planned to expand these systems. There is also a need to increase the maintenance level of the raw water facilities, repair the concrete work, and construct two finish water facilities.

There are five sewage treatment plants in Tulsa. Four are under the jurisdiction of the city and one is under the control of the Regional Sewer Authority. Three of the plants provide secondary treatment and two attempt to provide secondary treatment but do not quite achieve secondary treatment standards. The current system capacity is not considered adequate to meet projected system demands over the next 10 to 15 years and the city has planned to approximately double the capacity of two plants and phase out two plants. The fifth plant has the capacity to meet projected needs through the year 2000. Although the plants generally meet EPA National Pollution Discharge Elimination System effluent requirements, the standards are not met when the flow is too high.

Tulsa's network of 332 bridges is in good condition. In 1976 only four bridges were structurally deficient with improvement costs estimated at about $7 million.

There are 1,590.7 miles of street in Tulsa. The city maintains a Trafficways Filing System which contains the width, type, condition, and previous maintenance needs of every street on a block-by-block basis.

This inventory system is updated every four months and the most recent one was taken about a week ago when 201 miles of new street were added. There are approximately 1,443 miles of street paved with concrete or asphalt, and 143.3 miles of unpaved street with oil or gravel surfaces; 140 miles need to be resurfaced and 32 miles need to be reconstructed.

Contacts

Richard Bailey, Water and Sewer Systems	(918) 518-5577
Dewer May, Streets	(918) 518-5577

Responsibility for Capital Stock

All capital facilities are the responsibility of the city government. Within the city government there is a Department of Water and Sewerage. Street and bridge maintenance and improvements are under the jurisdiction of the City Commission of Streets and Public Properties.

Trend in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	1.7	1.8	3.3	2.8
Sewers	6.8	1.8	2.8	11.4
Water	4.8	6.3	4.6	6.8
Sanitation	--	.3	.4	.7
Housing and Urban Development	--	3.6	4.6	4.5
Public Buildings	--	--	.1	--
Parks and Recreation	2.1	2.5	4.7	11.8
Transit	--	1.1	1.4	.2
Airport	6.3	2.2	4.6	3.0
Hospital	--	--	11.3	15.0
Miscellaneous	3.1	10.4	6.8	4.4
Total	24.9	30.0	44.6	60.0
Capital Expenditures as a Percentage of Total Expenditures	29.7	33.2	36.7	42.3

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
262,000	332,000	332,000	0	+26.7

Area and Population Density (1975)

171.9 square miles
1,929 per square mile

2.21 Worcester, Massachusetts

Summary of Capital Stock Condition

In general, the condition of Worcester's capital infrastructure can be categorized as fair. The city's water distribution system of 630 miles is very old with many pipes greater than 100 years. The public work commissioner claims that the distribution system is slowly deteriorating because it is not being maintained adequately. Worcester has virtually no pipe replacement activities and a backlog of over 100 miles of pipe in need of cleaning and relining. Its water supply system is inadequate with a deficit of two MGD per day between consumption and maximum safe daily yield. The quality of the drinking water meets current EPA standards and does not receive extensive treatment. While no plans exist to construct filtration facilities, investment in water treatment may be needed to meet more stringent EPA standards. The city has outlined $52 million in needs for the water system which includes replacement of 100 miles of one inch to six inch mains and 50 miles of eight inch to ten inch mains.

The sewer system consists of 710 miles of pipe and is predominantly a separate storm and sanitary sewer. Some areas of the city are still serviced by combined sewers. Parts of the existing system are over 110 years old and have been subject to increasing breaks. Sewer line replacement has been minimal. Despite the fact that the city has a good cleaning program, pipe conditions continue to deteriorate. The principal capital need for the sewer system will be to convert the combined sewers into separate storm and sanitary sewers. Worcester participates in a regional sewage treatment facility with ten MGD capacity. The plant provides secondary treatment. The city's share of operations and maintenance of the plant is high because only two cities out of a planned six cities use the treatment facilities. They are paying for excess capacity. A new treatment plant for treating stormwater is currently being constructed. The total cost of building this new treatment facility and separating the combined sewers is $40 million. Other needed capital investment includes eight million dollars for upgrading pumping stations.

The Department of Public Works is responsible for 20 bridges, the oldest of which is 73 years. This older bridge is structually deficient and should undergo repairs or replacement. The other bridges are sound. The city has no program of bridge maintenance and if minor repairs are not made currently, sound bridges may soon fall into disrepair.

The condition of Worcester's streets is not very good. City officials estimate that of the 400 miles total paved streets, 50 percent need no work and 50 percent need resurfacing or reconstruction. In recent years the level of street resurfacing has increased to about 18 miles annually.

Ideally, the city would like to resurface 24 miles annually. Although funding for street maintenance and repairs has increased recently, city officials fear that annual resurfacing mileage will fall far below 18 miles when increased levels of Federal funds run out.

Contacts

Mr. Worth Landers, Commissioner of Public Works (617) 798-8151

Responsibility for Capital Stock

The Department of Public Works has responsibility for all of the infrastructure items described above. A regional authority is responsible for the local sewage treatment plant currently shared by Worcester and Auburn, Massachusetts.

Trend in Capital Expenditures (millions of dollars)

	1972-73	1973-74	1974-75	1975-76
Highways	.4	.5	.8	.9
Sewers	1.7	.7	.5	.5
Water	.5	.3	.2	.2
Housing and Urban Renewal	2.0	2.6	.5	2.1
Public Buildings	.2	--	--	--
Education	1.8	.7	.4	1.4
Other	4.5	2.5	2.6	.9
Total	11.1	7.3	4.9	6.0
Capital Expenditures as a Percentage of Total Expenditures	10.2	7.0	4.0	4.3

Trend in Population

1960	1970	1975	Percent Change 1970-75	Percent Change 1960-75
187,000	177,000	172,000	-2.9	-8.0

Area and Population Density (1975)

37.4 square miles
4,721 per square mile

3.0 RECOMMENDATIONS FOR INTENSIVE CASE STUDIES

We recommend that 8 cities of the 21 examined be selected for intensive case study. We added an addition city[1] that was not covered in the telephone survey. Five criteria are used for choosing the cities. First, the cities should reflect a variety of capital stock conditions ranging from seriously deteriorated to excellent. Second, there should be a variety of population sizes. Third, the cities should represent a broad regional distribution. Fourth, the cities should reflect a variety of local governmental entities responsible for the operation and maintenance of capital facilities. Last, there should be a broad range of fiscal conditions included in the sample. Not surprisingly, we find a close connection between fiscal condition and the condition of the capital stock.

The above criteria were the basis for choosing the following cities: Baltimore, Dallas, Des Moines, Hartford, New Orleans, Newark, Pittsburgh, Seattle, and St. Louis. The sample includes cities such as Dallas and Des Moines in which conditions of streets, sewers, water systems, and bridges appear to be very good, and it includes cities such as Newark, New Orleans, Pittsburgh, and St. Louis in which deterioration is reported to be extensive and seems to be getting worse. There is a broad range of populations, 138,000 for Hartford and 813,000 for Dallas. There are both declining and growing cities and a fairly good regional distribution with three from the Northeast, two from the North Central region, three from the South and one from the West. The sample of recommendations includes a diversity of local government forms: several cities have capital facilities entirely under the city government's jurisdiction, others have sewer and water services under special districts covering the entire metropolitan area. There are three cities with a manager-council organization (Dallas, Des Moines, and Hartford) and the rest are strong mayor cities. Finally, there is a wide range of fiscal conditions, from Newark with a critically weak tax base and lack of access to the capital markets to Dallas where high levels of services are maintained and local revenue sources are quite strong.

The following discussion summarizes each city in greater detail.

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[1]After careful deliberation, it was decided to include Pittsburgh, Pennsylvania, in the case study analysis because of the purportedly poor condition of the public capital stock. It was included in order to provide more insight into the problem of maintenance and renovation of urban capital stock.

Baltimore

Baltimore is an unusual city in that it is old, has a declining population base, and yet its capital facilities are reported to be in relatively good condition. Although much of its infrastructure is quite old, good management practices and fairly regular maintenance activities have contributed to the better-than-expected condition of the city's capital stock.

One problem area, however, is streets and highways. It appears that much more money is needed to improve the city's streets. This city provides an interesting counter-example to Newark and Pittsburgh in the Northeast.

Dallas

Dallas is a growing city with a very healthy economy. Capital facilities are reported to be in excellent condition, and city agencies appear to have extensive and innovative preventive maintenance programs.

The city's maintenance programs are of special interest, emphasizing professional management, productivity improvement, and the latest technology. These themes seem strong throughout the city government, which operates under a city manager. The fiscal situation is very good, and major investment in new infrastructure to serve population growth appears to present no financing problems. Dallas bonds get top ratings, and the voters have approved nearly all bond issues in the last 15 years. There are few facilities old enough to be subject to serious deterioration.

Des Moines

Des Moines is a medium size city with a stable population that appears to be more successful than many northern cities in anticipating and correcting infrastructure deterioration. For example, bridge corrosion was recognized as a serious problem 10 years ago, and a major bridge rehabilitation program since then has brought most city-responsibility bridges into good condition. Sewers are organized under a special district, and the water system, although a city agency, is unusual in having its own Board of Trustees which provides independent direction. In general, Des Moines appears to place a very strong emphasis on preventive maintenance. The fiscal condition of the city is very good.

Hartford

Hartford is an example of a smaller northeastern city that has deteriorating infrastructure items managed by the city but high quality capital facilities managed by regional authorities. Hartford provides evidence that one of the products of local government fiscal strain is

deferred maintenance. In contrast, the regional authorities operating sewer and waste facilities for Hartford through user charges continued to provide adequate maintenance and capital improvements during times when city-administered capital facilities were forced to cut back. Hartford has a city manager/council form of government.

New Orleans

Characterized as a "northeastern city located in the south", New Orleans faces population loss, deteriorating fiscal conditions and aging infrastructure. The street and bridge systems have serious problems, and according to city officials, capital investment and maintenance expenditures in recent years have fallen far short of spending needs. The city provides a good example of the correlation between deteriorating infrastructure condition and declining capital investment.

Newark

Of all the cities examined, Newark has the most intricately woven patchwork of infrastructure problems. A history of fiscal mismanagement, economic and demographic declines, and scarce financial resources has taken its toll on the levels of capital improvements and maintenance. These factors are compounded by the fact that most of Newark's infrastructure is very old. Some of the capital facilities, such as sewage treatment plants, are the responsibilities of regional authorities. As a result, Newark shares some of its infrastructure with Essex and Union counties, two of the most populated counties in the nation. This situation suggests some good possibilities for further analysis. Is regional sharing of capital facilities effective in providing better service levels than if the individual cities were to provide these services? How has the fiscal burden of these facilities been eased by regional arrangements? Are regional capital facilities, which may be insulated from the local political process, operated and maintained more effectively than at the city level?

Pittsburgh

Pittsburgh appears to provide one of the more illustrative cases of deteriorating capital stock conditions. These conditions have become more pronounced recently with the closing of numerous bridges throughout the city because they were not maintained at proper levels. Pittsburgh apparently provides a classic case in point as to the necessity of maintaining and renovating the public infrastructure.

In terms of the selection criteria outlined earlier, Pittsburgh is located in the Northeast with a population of between 250,000 and 500,000. It is an intermediate-aged city with a good deal of regionalization of public capital stock ownership. Its fiscal condition has deteriorated in the last ten years.

St. Louis

St. Louis faces a continuing crisis in maintaining capital facilities. For streets, bridges, the water system and the sewers, current conditions are reported to be poor, and the level of maintenance is unusually low, indicating that conditions are likely to grow rapidly worse. A significant mileage of street resurfacing has only been possible in the last two years because of the availability of Federal Community Development Block Grant and Local Public Works funds. Over 90 percent of the sewer system inside St. Louis is over 50 years old, and sewer collapses and flooding of basements are frequent. Overall, infrastructure deterioration in St. Louis is alarming, and together with Newark, St. Louis provides an example of how serious the problem can be.

Seattle

Seattle is a large city, with declining population and few fiscal problems. The condition of capital facilities is reporeted to be generally good, retained by a high level of preventive maintenance. There is an unusual amount of regional cooperation in the Seattle area which makes it of special interest. A regional district, the Municipality of Metropolitan Seattle, was formed 20 years ago to provide sewage treatment, placing Seattle far ahead of many cities in controlling water pollution. The same district now provides transit service. The city water utility has a metropolitan-wide service area. King County takes a much more active role in the providion of services than most metropolitan counties.

APPENDIX E: PERFORMANCE STANDARDS AND OPERATIONAL DEFINITIONS OF MAINTENANCE AND RENOVATION

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	E.1
2.0	STREETS	E.3
	2.1 System Description	E.3
	2.2 Performance Standards	E.5
	2.3 Factors Affecting Condition	E.7
3.0	BRIDGES	E.12
	3.1 Facility Description	E.12
	3.2 Performance Standards	E.13
	3.3 Factors Affecting Condition	E.15
4.0	SEWER SYSTEM	E.19
	4.1 System Description	E.19
	4.2 Performance Standards	E.20
	4.3 Factors Affecting Condition	E.23
5.0	WATER SYSTEM	E.26
	5.1 System Description	E.26
	5.2 Performance Standards	E.26
	5.3 Factors Affecting Condition	E.30
6.0	MASS TRANSIT	E.32
	6.1 System Description	E.32
	6.2 Performance Standards	E.33
	6.3 Factors Affecting Condition	E.34
	BIBLIOGRAPHY	E.37

1.0 INTRODUCTION

Any effective assessment of the condition of cities' capital stock, or infrastructure, requires a set of standards or criteria on which to evaluate system performance. This appendix outlines our findings regarding relevant criteria in five infrastructure areas -- streets, bridges, sewer and water systems, and mass transit facilities.

Our research disclosed a wide variety of standards across systems. Measures ranged from Federally mandated performance standards in the sewage collection and treatment area, to assessment surveys conducted by the Federal government to determine capital needs for streets, bridges, and sewer systems, to rules of thumb suggested by trade associations and equipment manufacturers. There was an equally wide variance in how the standards are actually applied at the local level. Where Federal regulatory standards are involved, there is good comparability in the application of these standards across systems and cities. For example, EPA requirements for secondary treatment are clearly delineated and municipal treatment facilities must meet these requirements in order to receive the National Pollution Discharge Elimination System (NPDES) permit for operation. In other instances, condition assessment techniques which have been widely utilized in national assessments of infrastructure needs, but are not mandated performance requirements, have not always been adopted by local governments. For example, the Present Serviceability Rating, used to determine highway pavement condition for the biennial Highway Needs' Studies, is only infrequently employed by municipalities to rate the condition of city street systems. In the area of maintenance practices, there are few if any standards which can be applied across systems and localities to evaluate the adequacy of maintenance efforts. Instead, levels of spending must be analyzed over time, in the context of the age and condition of the infrastructure systems, to infer whether or not the stock is being adequately maintained and replaced.

The standards presented in this appendix for each infrastructure area do not comprise an exhaustive list. Rather they represent the distillation of the most important and most readily available criteria based on:

- Discussions with industry experts and familiarization with the relevant literature.
- Pilot tests in three cities to determine the scope and specificity of data actually collected at the municipal level.

The following chapters -- one for each infrastructure area -- have been organized to provide four types of information:

- Brief description of the system, including definition of relevant terms.
- Explanation of the most commonly used performance standards.
- Brief discussion of the various factors affecting performance.
- Bibliography of relevant literature.

2.0 STREETS

2.1 System Description

In 1976, Congress established a functional classification system for roads, streets, and highways. For urban areas, the following nomenclature has been adopted:[1]

A. Principal arterial system: Designed for long distance travel; serves the highest traffic volume corridors and longest trip lengths; carries a high proportion of total urban area travel. The system includes:

   1. Interstate highways
   2. Other freeways and expressways
   3. Other principal arterials.

B. Minor arterial system: Designed for shorter distance, lower speed and mobility than principal arterials; such routes interconnect with and augment the principal arterial system.

C. Collector system: Designed to distribute trips to and from the arterials to their ultimate destinations; such routes provide for local traffic movement within residential neighborhoods, commercial and industrial areas.

D. Local Street System: All streets not on higher systems; provides direct access to abutting land and higher systems; no bus routes or through traffic.

As the following table indicates, in urban areas the principal and minor arterial systems account for between 65 and 80 percent of total travel volume, while local streets account for between 65 and 80 percent of total mileage.

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[1] The Status of the Nation's Highways: Conditions and Performance, Report of the Secretary of Transportation to the U.S.Congress pursuant to Section 3, P.L. 89-139, Government Printing Office, Washington, D.C., 1977, pp. 53-54.

System	Range (Percent)[1]	
	Travel Volume (VMT)	Miles
Principal Arterial System	40-65	5-10
Principal Arterial plus Minor Arterial System	65-80	12-25
Collector System	5-10	5-10
Local System	10-30	65-80

Many municipalities have adopted the Federal functional classification scheme and classified all their streets accordingly. Others have not. Some do not have complete statistics on their own system, particularly for streets not eligible for Federal aid funds. Thus, while the Federal functional classification scheme of 1976 is a logical and reasonable one, it may not always be possible to translate municipalities' individual categorization schemes into the more standardized Federal format.

Street systems often have complicated jurisdictional arrangements. Inside city boundaries, states are usually responsible for interstate highways and often other roads as well, and counties often have street responsibilities within municipalities. Occasionally maintenance responsibilities for particular streets are split between governments. In all urbanized areas as of July 1976, 23 percent of the total mileage was under state jurisdiction, 75 percent under local, city or county jurisdiction and the remaining two percent under Federal or other special authority control.[2] The Federal government provides assistance for roads under state and local jurisdiction which are on the Federal-Aid System. In urban areas, approximately 23 percent of the total mileage is on-system.[3] The latter is composed of four major road systems:

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[1] U.S. Department of Transportation, Federal Highway Administration, Highway Functional Classification, July 1974, p. II-14.

[2] Urban Systems Study, Report of the Secretary of Transportation to the U.S. Congress pursuant to Section 149, P.L. 94-280, Federal-Aid Highway Act of 1976, 1977, p. 60.

[3] U.S. Department of Transportation, Federal Highway Administration, Summary of Federal Highway Statistics, 1978.

A. The Interstate System.

B. The Federal-Aid-Primary System (FAP). This system is primarily rural with the exception of urban extensions of state highways.

C. The Federal-Aid Secondary System. This system is exclusively rural.

D. The Federal-Aid Urban System (FAUS). This system consists of urban arterial and collector routes exclusive of urban extensions of the Federal-Aid Primary System. Eighty-one percent of all urban arterials and collectors are eligible for Federal funding under FAUS.

2.2 Performance Standards

While performance standards for streets and highways have not been mandated by the Federal government, a condition rating system has been established as the basis of the U.S. Department of Transportation's biennial highway needs reports. The National System Condition Index employs the "sufficiency rating" technique to assess three aspects of highway condition and performance: physical condition, safety, and operating performance.

The "condition" element relates to the structural characteristics of a highway and covers such physical features as pavement thickness, smoothness of ride and drainage adequacy. The primary measure of pavement condition is the Pavement Serviceability Rating (PSR). Based on a five point scale, the system classifies streets and highways with a PSR of 3.5 to 5 as "good", with a PSR of 2.5 to 3.5 as "fair", and with a PSR of 0.0 to 2.5 as "poor".[1] Pavements classified as "good" exhibit only slight evidence of pavement deterioration such as minor rutting and cracking. Pavements ranked "fair" are noticeably inferior to new pavements, exhibiting more extensive cracking, patching and,with rigid pavement, some joint failures. Pavements classified as "poor" are deteriorated to such an extent that they are in need of resurfacing or even complete reconstruction.[2] Generally, only newly constructed roads receive a "5" rating. The Department of Transportation maintains that once highest rated pavement on heavily travelled roadways reaches fair condition, the rate

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[1]The PSR "poor" rating varies by type of street. Principal arterials rated below 2.5 are classified as "poor" while minor arterials and collectors rated below 2.0 are rated as "poor".

[2]U.S. Department of Transportation, Federal Highway Administration, National Highway Inventory and Performance Study Manual, July 1975, p. VI-13.

of deterioration accelerates as the pavement approaches poor condition[1] and requires resurfacing or reconstruction.[2]

The "safety" element of the sufficiency rating is an indicator of accident potential. The major sub-elements comprising this category include such factors as travelway width, vehicle separation, shoulder type, and roadway access. The "service" element is a measure of congestion and indicates how well the roadway provides service under given traffic conditions. The primary sub-elements used to evaluate service are operating speed and V/C ratio -- the ratio of actual peak hour traffic to the maximum amount of traffic a highway can accommodate each hour. In developing a sufficiency rating for urban areas from these three elements (condition, safety and service), the Department of Transportation weighs the "service" element, which is an indicator of congestion, more heavily for principal arterials because of higher volumes; on lower volume streets the heavier weight is given to the "condition" element:

	Urban Weights[3]		
	Principal Arterial	Minor Arterial	Collector
Condition	30	40	50
Safety	30	30	30
Service	40	30	20

While data on road condition as of the 1976 Needs Report are available from the Department of Transportation for urbanized areas, there are difficulties in utilizing them to ascertain the condition of city streets. Local streets,which represent the majority of city streets, were excluded from the survey. Cities also often perform their own annual surveys of road condition and their rating schemes may, or may not, be comparable to the Department of Transportation's system.

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[1]Department of Transportation models of the rate of pavement deterioration are based on the results of the AASHO Road Test which examined the impact on pavement condition of traffic volume, axle loads and pavement thickness. The results are contained in a Highway Research Board Publication entitled "The ASSHO Road Test: Report 5, Pavaement Research", Special Report 61E, Washington, D.C., 1962

[2]There are two types of resurfacing techniques: 1) overlaying existing pavements plus adding material to bring shoulders up to grade, and 2) removing the existing surface and adding a new one. Reconstruction involves rebuilding the roadway from the base in essentially the same alignment.

[3]The Status of the Nation's Highways, op.cit., p. 384.

Since many cities are able to provide an estimate of the number of miles of street in need of resurfacing and reconstruction, this information can be used to provide the basis for a comparable rating scheme across cities. Streets in "good" condition can be characterized as not requiring any repair or resurfacing activity. Streets in "fair" condition require repairs, including such typical maintenance activities as pothole filling, patching, crack sealing, seal coating, and minor resurfacing. Streets in "poor" condition require extensive resurfacing or reconstruction.

2.3 Factors Affecting Condition

The condition of streets and highways are a function of several variables including age (time of initial construction and major reconstruction or resurfacing), paving materials, usage (including travel volume and type), weather conditions, soil characteristics, investment levels and maintenance practices. Each of these factors is discussed briefly below:

A. Age and materials. There are two types of pavements: (1) Rigid and (2) Flexible. Rigid pavements are constructed of Portland cement concrete. Minimum thickness is about five inches for residential streets. Those on roads with large traffic volumes and heavy vehicles will be thicker, may be reinforced, and are usually constructed on a prepared granular base. Some are designed to be bases and are surfaced with several inches of bituminous concrete when originally constructed.

Flexible pavements consist of a mixture of asphalt (or occasionally tar) and aggregate. The highest quality flexible pavement is asphaltic concrete, a controlled mixture of asphalt cement and graded aggregate combined in a hot-mix plant and placed with a paver. A lower quality surface is termed road mix in which aggregate is windrowed on the road surface, sprayed with unheated asphalt, mixed in place, and spread on the surface. Road mix is suitable only for relatively low traffic volumes. A flexible pavement, in contrast to some rigid pavements, relies primarily on a base to support traffic loads since the pavement surface is relatively thin. If the surface is less than one inch thick, it is termed a surface treatment rather than a pavement. Surface treatments, such as a seal coat on a base, have been used in several cities for local streets and repeated so many times that some of these surfaces are now more than one inch thick. Some surface treatments and road mix pavements have been laid without benefit of base. This is seldom done today, but some residential, low-volume streets are surfaced with several layers of such materials.

Street surfaces are also ranked by load carrying capacity as follows:[1]

- High -- Portland cement concrete or asphaltic concrete on a prepared base with a combined thickness of 7 inches or more.

- Intermediate -- Thin Portland cement concrete pavement or bituminous mix on a prepared base with a combined thickness of less than 7 inches.

- Low -- Surface treatment usually on some type of base, a graveled surface, or simply graded soil with no surface course.

The useful lives of different types of pavements vary. Portland cement concrete is estimated to endure longest and is commonly designed for a useful life of 20 years. The useful life of asphalt surfaces is somewhat shorter, averaging between 15 and 20 years.[2]

Some of the first Portland Cement concrete pavements laid more than 60 years ago, however, are still carrying traffic. Many have been overlaid with asphaltic concrete, but a few still endure as originally laid. Some bituminous pavements, likewise, continue to serve long beyond their 15-to-20 year design life. Where the base is thick enough and maintenance is adequate, periodic seal coats or thin overlays can renew the surface sufficiently to extend their lives for many years beyond their design life.

The key to economy for roads and streets is to design for the estimated traffic loads and climatic conditions, maintain the pavement adequately during its useful life, and resurface when necessary.

Portland cement concrete requires less maintenance than other materials, but it is also more expensive to build and repair. Patching and crack sealing on asphalt pavements are accomplished more easily, quickly, and economically. An oft-repeated rumor is that Portland cement

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[1] Ibid., p. 100.

[2] Based on conversations with Federal Highway Administration officials.

concrete should not be used in areas with extreme temperature changes because the rigid concrete cracks too readily under these conditions. Knowledgeable designers, however, do not hesitate to use Portland cement concrete in northern locations. They simply space contraction joints closer together. Most northern cities have many miles of Portland cement concrete pavement that serves well under difficult conditions.

Road-mix surfaces are unsuitable for heavy traffic. Depending on usage, the life of a road mix surface may be as low as five years. It is common practice, however, to extend this life repeatedly by the use of seal coats and to remix the surface with additional materials and relay it when necessary.

Seal coats qualify as surface treatments. Their purpose is to rejuvenate the old pavement, seal the surface, and provide a new wearing surface. It is common practice to patch existing pavements just prior to sealing, but crack-filling is ordinarily not necessary because the spray of liquid asphalt fills most cracks adequately. The seal coat consists of a thin coating of hot or emulsified asphalt which is then covered with sand or pea-size gravel and rolled. Slurry sealing consists of spreading a thin coat of emulsified asphalt and sand. Open-graded bituminous pavements require sealing sooner and more often than densely-graded mixtures. The effective life of a seal coat is 5 to 7 years. If pavement and base are adequate to carry the traffic volumes and loads, seal coats are probably the most economical way to extend the life of existing pavements.

Somewhat comparable to seal coats are carpet coats. Although similar to resurfacing these are also termed surface treatments because their design thickness is less than one inch. The bituminous materials and aggregate are mixed in a hot-mix plant and placed with a paver. The cost is higher than for seal coats, but the final surface is smoother and lasts longer. On city streets with curb and gutter, seal coats and carpet coats do not raise the pavement surface sufficiently to cause problems at the gutter joint as resurfacing often does.

Resurfacing consists of the application of a 1 to 3 inch asphalt overlay to existing pavement. Service lives range from 5-10 years for 1 inch overlay to

15-20 years for a 3 inch overlay.[1] Some cities resurface infrequently and instead emphasize the application of seal coats on a short cycle. Since resurfacing usually adds to the overall street thickness, drainage problems can occur after several overlays; resurfacing is also much more costly than seal coating. Techniques are now being developed to recycle existing asphalt pavement for resurfacing, a process which would minimize many of the difficulties with current resurfacing practices.

B. Traffic volumes and loads. Street condition is also a function of traffic conditions. Roadways designed for light traffic loads and volume are often damaged by increases in the magnitude and frequency of axle loads and require increased maintenance. If the added strength cannot be obtained by resurfacing, the entire street may have to be rebuilt. A recent study[2] estimated that, for the years 1956-1975, heavy trucks were responsible for some 57 percent of highway maintenance expenditures. Every few years new laws have increased allowable truck weights.

C. Weather conditions. Climatic conditions affect not only the type of paving surface used, but also its useful life. Recent severe winters have caused heavy road damage. The saturation of base and subbase materials with moisture during the spring thaw rapidly accelerates the loss of pavement serviceability.[3]

D. Soil Characteristics. The subgrade provided by soils is a key determinant of the performance and service lives of streets and highways. A maintenance text has stated that "Most of the maintenance problems for urban roadways can be traced to failures of the supporting soils."[4] Soils with a high clay content are subject to swelling from moisture which can upheave pavements,

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[1] W.S. Smith, A Flexible Pavement Maintenance Management System, The Institute of Transportation Studies, University of California, 1974.

[2] Kiran Bhatt, Michael Besseley and Kevin Needs, An Analysis of Road Expenditures and Payments by Vehicle Class (1956-1975), The Urban Institute, Washington, D.C., March 1977, p. 63.

[3] E.J. Barenberg, B.P. Hazarika, "Use of University of Illinois Test Track to Evaluate Pavement Performance", Transportation Research Record 572, 1976, pp. 38-50.

[4] W.S. Foster (editor), Handbook of Municipal Administration and Engineering, McGraw Hill Company, 1978, pp. 1-6.

and soils with relatively large sand contents are stronger than soils containing high clay content. The AASHO Road Test found that a 1-3 inch flexible pavement surface on high quality soil could perform equivalently to a 5-6 inch surface on poor soils.[1]

E. Investment levels and maintenance practices. Street condition is also affected by the level of investment in resurfacing and reconstruction as well as in maintenance. While there are no standards regarding adequate levels of maintenance, the following represent a list of common street maintenance practices:

- Pothole repair and patching;
- Seal coating and minor resurfacing;
- Curb, gutter and drainage repair;
- Mowing and tree trimming in planted areas.

Levels of maintenance spending per mile of street for the different types of streets provide an estimate of the magnitude and continuity of street rehabilitation and repair efforts.

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[1] R. Whiteside, et.al., Changes in Legal Vehicle Weights and Dimensions, National Cooperative Highway Research Program Report 141, Highway Research Board, Washington, D.C., 1974, p. 60.

3.0 BRIDGES

3.1 Facility Description

By Federal (Department of Transportation) standards, a bridge is "a structure erected over a depression or an obstruction such as water, highway, or railway and having a passageway for carrying traffic or other moving loads and having a length measured along the center of the overcrossing of more than 20 feet."[1] According to the American Association of State Highway and Transportation Officials (AASHTO), a bridge is the highest unit investment of all elements in the highway system.[2]

Bridges can be classified both by type and by function. Most bridges can be categoriezed as one of four types: simple span, arch, suspension, or truss. "Type" here refers to the kind of support structure. It is also useful to categorize bridges by span length assuming, in most cases correctly,[3] the longer the bridge is, the more complex and therefore, the more important it is and more expensive to maintain the structure. Bridges can also be classified by the following functional categories: arterial, non-arterial, or waterway, including moveable, fixed, and combination fixed and moveable structures. Given the cost of operating and maintaining moveable bridges, many localities are attempting to convert these to fixed structures.

Bridges are comprised of several elements:

A. The superstructure composed of beams, girders, and trusses depending on span length and required load capacity. Most bridge superstructures are either metal (steel), concrete or timber.

B. The substructure, the portion of the bridge that transmits the load and stresses from the structural deck, superstructure, or load supporting system to the ground. Substructures have two functional components -- abutments which provide end support and piers which provide interior support. Piles and/or footings may be used to support abutment as well as piers.

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[1] U.S. Department of Transportation, Federal Highway Administration, National Highway Functional Classification and Needs Study Manual, February 1970, p. V-23.

[2] American Association of State Highway and Transportation Officials (AASHTO), Manual for Bridge Maintenance, Washington, D.C., 1976, p. 3.

[3] Relatively short moveable bridges are the obvious exception here. Moveable bridges are among the most expensive types of structures to maintain.

C. The surface, comprised of two elements -- the structural deck which provides the load carrying capacity of the deck system and the wearing course, the riding surface for traffic which is applied on top of the structural deck.

D. Sidewalks, curbs and railings.

Similar to highways, bridges often have complicated jurisdictional arrangements. Responsibility for bridges within municipalities is often divided among state, county and city governments. In some cases, responsibility is divided for a particular structure. For example, in New York City, for railroad bridges the city is responsible for maintaining the deck -- the railroad, for the structural support elements. In Allegheny County, Pennsylvania, the state has responsibility for the bridge surface and the county has responsibility for everything else.

Bridges on the Federal-aid system, which amount to approximately 41 percent of all U.S. bridges, are eligible for funding from the regular Federal-aid highway programs as well as from the Special Bridge Replacement Program.[1] The recent (1976) realignment of the Federal-aid system has been responsible for increasing the number of bridges in urban areas eligible for Federal assistance. The Safer Off-System Highway Program, the only source of Federal funds for off-system bridges to date, has had limited funding. However, the recently passed Surface Transportation Act includes a provision for funding off-system bridges from Bridge Replacement Program appropriations.

3.2 Performance Standards

Performance standards for bridges have been developed by AASHTO and incorporated by the Federal government into an assessment process which is a prerequisite for Federal assistance. The National Bridge Inspection Standards have been in effect since May 24, 1971, requiring a biennial survey of bridges on the Federal-aid system.

The assessment process involves rating bridge deficiencies as to condition and appraisal on a scale of 0 to 9. The condition rating

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[1] Federal-aid highway program funds are distributed to states on the basis of lane mileage and population. The matching ratio is 70:30 except for the Interstate system which is 90:10. Bridge Replacement Program funds, authorized since FY 1972, are allocated to states on the basis of need. The newly passed Surface Transportation Act increased the matching ratio from 75:25 to 80:20 for bridge replacement.

considers the physical state of the bridge itself, while the appraisal rating evaluates the bridge in relation to the system of which it is a part. Categories of deficiencies include: (1) structural condition; (2) adequacy of safe load capacity; (3) roadway width and deck clearance; (4) horizontal and vertical underclearance; and (5) waterway adequacy. From these ratings, summary deficiency estimates are derived of structurally deficient and functionally obsolete bridges. A structurally deficient bridge is one that because of structural inadequacy has either been restricted to light vehicles (posted) or has been closed. A functionally obsolete bridge is one on which deck geometry, approach, roadway alignment, or load carrying capacity can no longer safely service the system of which it is an integral part.

To receive funding from the Bridge Replacement Program, a sufficiency rating is developed for each bridge surveyed based on a weighting of seven different criteria including "age of the structure" and "essentiality" as well as "appraisal rating" and "structural adequacy". Sufficiency ratings range from 0 to 100; the lower the sufficiency rating, the higher the priority for replacement. Major emphasis is placed on bridges that are structurally deficient (this factor is given a 50 percent weight in the total assessment).[1]

The surveys of on-system bridges and estimates of off-system bridge condition indicate that approximately one out of every five bridges can be characterized as deficient.[2] The largest category of deficiency is deck geometry, a situation in which the bridge deck is narrower than the approach roadway. Even where bridge decks are as wide as approach roadways, drivers tend to veer away from the curb and railing because of the "tunnel effect". This is especially true on bridges with heavy superstructures abutting the roadway. Many of these old bridges are still in use, particularly on county and township roads. They are acceptable only for light traffic volumes.

While the national bridge surveys are useful in assessing the condition of bridges in municipalities, they have obvious limitations. Off-system bridges are not systematically surveyed. Thus, condition ratings are often limited to those bridges on the Federal-aid system. However, several municipalities conduct a complete survey of all bridges within the city limits including off-system bridges and, because of the Federal requirement for a biennial survey, frequently use a rating system which can be made comparable to the Federal system. In addition, at least in dollar terms, the cost of eliminating deficiencies of on-system bridges typically represents a major portion of a city's total capital investment requirement for bridges.

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[1] U.S. Department of Transportation, Special Bridge Replacement Program, Seventh Annual Report to the Congress of the U.S., Washington, D.C., 1978, p. B6.

[2] Ibid., p. 4. I.e., 105,000 bridges out of a universe of 568,000 bridges (the latter number is an estimate by The Road Information Program [TRIP]).

3.3 Factors Affecting Condition

Bridge condition is a function of several variables including age and material composition of the structure, traffic intensity and loads, climate and environmental factors, construction and maintenance practices. Each of these variables is discussed briefly below:

A. Age and composition. Bridge superstructures are constructed either of metal (steel), concrete, or timber. Structural decks are made of reinforced or prestressed concrete, steel plates, or grids, or wood planking. The wearing course is composed of typical paving materials, either asphaltic concrete or Portland cement concrete.

Steel bridges are susceptible to corrosion from weather. Neglect of painting and the use of road salt accelerate the corrosion of steel members. For concrete construction bridges, corrosion from salt is the primary problem. Poor construction and design are mentioned as secondary factors contributing to deterioration of decks and structural members.[1] Wooden bridges deteriorate mainly because of weather, with frequent wet/dry cycles accelerating the process.

Bridges engineers estimate the life expectancy of a bridge at between 30 and 50 years. And, according to the Department of Transportation estimates, three out of four bridges in the United States are over 35 years old.[2] However, it has been demonstrated that the effects of age vary widely for different bridges even in the same geographic area.[3] Thus, age per se may not be a good indication of bridge condition.

B. Traffic intensity and loads. Similar to highways designed to accommodate traffic conditions and load factors, bridges are also affected by traffic and load considerations. Unpredicted increases in traffic volune and live loads adversely affect bridge wearing surfaces as well as safe load carrying capacities. When a

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[1] R.H. Berger and Stanley Gordon, "Extending the Service Life of Existing Bridges", Transportation Research Report, No. 664, 1978, p. 48.

[2] Estimates provided by engineers in the Bridge Division, U.S. Department of Transportation.

[3] Philip D. Cady, "A Study of the Effects of Construction Practices on Bridge Deck Construction", Highways Research Board Special Report, No. 16, 1971, p. 11.

bridge consistently sustains vehicle loads far in excess of its design capacity, damage will occur. Bridges experience fatigue, indicated by splitting and cracking of steel or concrete members. Research has indicated a correlation between bridges experiencing structural distress and the number of overloaded vehicles traversing these bridges.[1] Many bridges are marked for maximum loading to prevent fatigue. However, some truckers know that just one overload will not cause the bridge to collapse so they do not hesitate to overload bridges marked for minimum weights if no patrolman is near. However, repeated overloads can eventually result in complete collapse. Given the type of structure and estimates of loading conditions to which the bridge will be subjected, it is possible to predict expected bridge fatigue lives.[2]

C. Climate and environmental factors. Climate has a significant impact on the useful life of bridge structural elements and surfaces. The primary maintenance problem of bridges in the last 10 years -- the deterioration of concrete bridge decks[3] by spalling[4] -- is directly related to the use of road salt in areas with severe winter climates. The chlorides added by the salt destroy the high alkalinity of the concrete deck surface which normally seals the encased steel reinforcing rods of the deck structure against corrosion. As the rods corrode they expand, cracking and delaminating the surrounding concrete. The problem is concentrated in the northeast and midwestern states where increased and extensive use of salt[5] can now cause significant spalling of bridge

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[1] Celab N. Kostem, "Overloading of Highway Bridges-Initiation of Deck Damage", Transportation Research Record, No. 664, Transportation Research Board, Washington, D.C., 1978, p. 207.

[2] U.S. Department of Commerce, Bureau of Public Roads, Maximum Desirable Dimensions and Weights of Vehicles Operated on the Federal-Aid Systems, Report pursuant to Sec. 108(k) of the Federal-Aid Highway Act of 1956, August, 1964, pp. 143-149.

[3] "Bridge Deck Repairs", Research Results Digest, No. 85, Transportation Research Board, March 1976, p. 1.

[4] Spalling refers to the breaking off of pieces of concrete from the deck structure.

[5] Salt use nearly doublted between 1966-1967 and 1975-1976 -- from six million metric tons to 10-11 million metric tons according to Philip D. Cody, et. al., "Deep Impregnation of Concrete Bridge Decks with Linseed Oil", Transportation Research Record, No. 664, Transportation Research Board, Washington, D.C., 1978, p. 183.

decks in four to six years.[1] While concrete patching and/or the application of waterproof coatings are the most prevalent means of repair, there are a wide variety of repair techniques and little consensus about the adequacy or cost/effectiveness of any one approach.[2]

Freezing and thawing cycles also affect the condition of bridge surfaces, particularly the Portland cement concrete and asphaltic concrete wearing surfaces. Air temperatures vary more often and more widely than ground temperatures; and because the undersides of bridges are exposed to the air, temperatures at paving surfaces fluctuate widely. Additional strain occurs because of traffic loads. When moisture is present, whether from rain, snow, or dew, it seeps into fissures and cracks in the pavement. Whenever the temperature then dips below freezing, the moisture freezes and expands, placing additional stress on the pavement.

Air pollution is another cause of bridge deterioration resulting in corrosion of the structural members.

And finally, waterway bridges can be subject to scouring around abutments and piers which undermines bridge foundations. If bridges are designed properly, they survive normal stream flows. Unusual flows, resulting from storms and shifts in stream flows, can increase the likelihood of scouring and ultimate erosion of the bridge foundation.

D. Construction and maintenance practices. Poor construction techniques including improper setting and curing of the concrete as well as unfavorable weather conditions during setting are another cause of bridge deterioration.

Once construction is completed, spending outlays on bridge repairs and maintenance provide an indication, over time, of the adequacy and continuity of efforts to maintain bridges in good condition. While definitive preventive maintenance standards have not been

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[1] John Kliethermes, "Repair of Spalling Bridge Decks", Highway Research Record, No. 400, Highway Research Board, Washington, D.C., 1972, p. 8.

[2] Richard Hay, "The Bridge Deck Problem - An Analysis of Potential Solutions", Public Roads, March 1976, p. 142. This article summarizes the pros and cons of various repair techniques for arresting bridge deck deterioration.

established, the following are commonly employed practices:[1]

1. Testing of bridge decks (taking cores, testing with a voltmeter, etc.) to determine extent of deterioration.

2. Removal of contaminated concrete deck surface, pot chips and overlay. Application of waterproof membranes over the deck surface to extend deck life.

3. Painting of bridges on a 10-year cycle, if possible.

4. Structural repairs including:
   a. Guniting -- spraying of concrete to repair badly damaged surface areas.
   b. Repairs to the substructure -- abutments and piers.

5. Cleaning of deck joints and drainage system.

6. Repair of curbs, sidewalks and railings.

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[1]Douglas H. Beeson, Integration of Maintenance Needs Into Pre-Construction Procedures, Byrd, Talleny, MacDonald, and Lewis Consulting Engineers, for the U.S. Department of Transportation, April 1978, p. 113.

4.0 SEWER SYSTEM

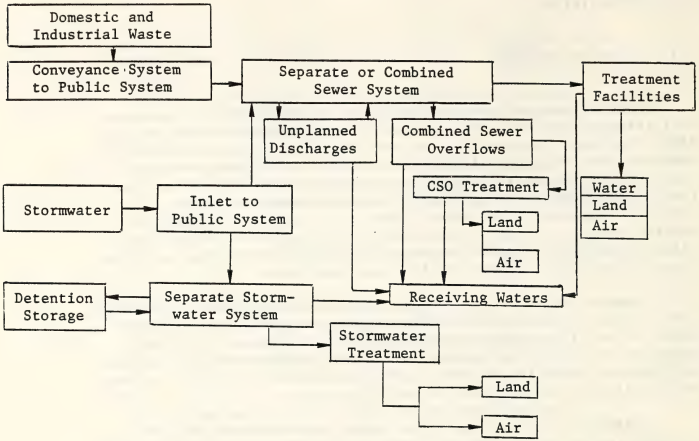
4.1 System Description

Sewer systems are composed of two major components -- treatment facilities and the collection system, including pumping stations and pipes that carry the sewage to be treated. The collection system is composed of a hierarchy of pipes of different sizes and materials. House drains connect to laterals which run along the street and are typically the smallest sewer line -- usually between six and eight inches in diameter. The lateral lines empty into trunk lines which service several streets. From these trunk lines sewage flows into large interceptor pipes which carry the sewage to the treatment plant. Outfalls carry the effluent to the receiving water.

A sewage system is designed to make the greatest use of gravity flow. When the topography dictates otherwise, the sewage is pumped unhill at a lift station through a sewer line called a force main. Manholes are located wherever a sewer line changes direction, slope, or pipesize, where two or more lines join, and along lengthy segments of pipe to facilitate inspection and cleaning.

In addition to manholes, other sewer appurtenances include: 1) inlets which, in a separate system, carry storm water to the underground storm sewer system; 2) catch basins which trap surface runoff debris; and 3) regulators which, in a combined system, control the discharge from collecting sewers into intercepting or relief sewers.

There are essentially two sources of pollution: 1) sewage from known point sources of untreated waste, including raw sewage from residential and commercial users and industrial waste; and 2) non-point sources, including urban runoff. The latter, exacerbated in storm conditions, carries pollution from streets and parking areas, multiple residences, commercial and industrial facilities into the sewer system. In many cities, a single combined sewer system handles both sources of pollution. During wet weather periods, flows may exceed the capacity of the treatment plant and collection system causing flooding and/or direct diversion of combined waste and runoff waters into receiving streams. In other cities, separate sanitary sewers handle known point domestic and industrial waste and storm sewers handle storm runoff. Since the costs of replacing combined sewers with separate storm and sanitary lines is often prohibitive, alternative solutions are being investigated to the combined sewer overflow problem, including temporary storage and/or treatment of storm overflows. The following diagram illustrates the relationships among various components of sewer systems:



Municipal sewage systems often have complicated jurisdictional arrangements. More often than not, treatment facilities and major interceptors connecting the treatment to the collection system are the responsibility of a regional sewer authority, while the smaller diameter pipeline located within the city limits is under city responsibility.

4.2 Performance Standards

Performance standards are much more clearly defined in the sewage treatment area than for the collection system. Treatment plants must satisfy Federal EPA effluent requirements in order to receive the requisite NPDES (National Pollution Discharge Elimination System) permit for operation. The current minimum requirement is for secondary treatment with defined limitations on the discharge of biochemical oxygen demand (BOD) and suspended solids and clear delineation of an acceptable PH range for the secondary effluent.[1] Publicly owned treatment works (POTW's)

[1]Environmental Protection Agency, "Water Programs, Secondary Treatment Information," The Federal Register, Vol. 41, No. 44, July 26, 1976, pp. 30788-30789.

are also responsible for establishing and enforcing pre-treatment standards to control the introduction of non-domestic waste into their facilities as a pre-condition for NPDES permit approval.[1] Compliance with the secondary treatment requirement was to be achieved by July 1, 1977, although exemptions may be granted which extend the deadline to July 1, 1983. Pre-treatment programs will be required by the latter date.

Guidelines have also been established for estimating the operating and maintenance staffing requirements of municipal waste water treatment facilities of varying sizes and levels of treatment.[2] A series of curves relating operation and maintenance (O&M) manhour requirements for all the unit processes used in waste water treatment provides the basis for derivation of an appropriate staff complement. EPA has also published a recent survey of operation and maintenance costs for 348 waste water treatment plants with design capacity of greater than 1.0 MGD.[3] Curves relating O&M costs to size of plant, staff size, and geographic area provide benchmark data against which individual plant operation can be measured.

Similar data regarding manpower requirements and appropriate levels of O&M expenditures are less readily available for the collection system, at least for systems with service population greater than 500,000.[4] The previously mentioned EPA survey[5] did provide data on operations, maintenance and minor repair costs for 155 sewer collection systems relating total costs to size of service population, total length of gravity sewers

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[1] Environmental Protection Agency, "General Pre-Treatment Regulations for Existing and New Sources of Pollution," The Federal Register, Vol. 43, No. 123, June 26, 1978, p. 27736.

[2] Methods for estimating plant staffing requirements are contained in three reports contracted by EPA: 1) Black and Veatch, Estimating Costs and Manpower Requirements for Conventional Waste Water Treatment Facilities, October 1971; 2) CH_2M Hill, Estimating Staffing for Municipal Waste Water Treatment Facilities, March 1973; 3) Department of Industrial Engineering and Engineering Research Institute, Iowa State University, Estimating Staff and Cost Factors for Small Waste Water Treatment Plants Less Than 1 MGD, Part I, Staffing Guidelines for Conventional Municipal Waste Water Treatment Plants Less Than 1 MGD, June 1973.

[3] Dames and Moore (for EPA), Analysis of Operations and Maintenance Costs for Municipal Waste Water Treatment Systems, February 1978, pp. 4-1, 4-52, Appendix E.

[4] EPA does have 2 studies concerning manpower requirements for waste water collection systems for service populations less than 500,000 provided by the Center for Manpower Research and Training, North Carolina A&T State University: 1) Manpower Requirements for Waste Water Collection Systems in Cities and Towns Up to 150,000 in Population, June 1973; and 2) Manpower Requirements for Waste Water Collection Systems in Cities of 150,000 to 500,000 in Population, March 1974.

[5] Dames and Moore, op.cit., pp. 5-1, 5-12, Appendix G.

and O&M staff size. Relatively small sample size for certain types of sewer systems as well as difficulties in recording and allocating costs limit the usefulness of these results as benchmark data.

One of the primary indicators of collection system performance (for separate sanitary and storm sewers) -- the extent of Infiltration/Inflow[1] -- is measured in cost/benefit terms. In accordance with Section 201(g)(3) of the Federal Water Pollution Control Act Amendments of 1972, all applicants for waste water treatment facility grants must conduct a cost-effectiveness analysis to demonstrate that each sewer system discharging into the treatment works is not subject to excessive I/I. I/I is considered excessive if the cost of transporting and treating sewage with existing I/I levels over a 20 year period is greater than the estimated cost of eliminating extraneous flows by locating and correcting the sources of I/I.[2]

Given EPA's experience with I/I studies involving lengthy, costly, yet often inadequate or inaccurate analyses, the agency has proposed a more simplified standard on which to determine excessive I/I.[3] As a general rule of thumb, an infiltration rate (based on the highest weekly average within a 12 month period) of greater than 1500 gallons per day per inch of pipe diameter per mile of sewer pipe is considered economic to rehabilitate, therefore requiring a more in-depth sewer system evaluation survey (SSES). This determination can be made by looking at the infiltration rate of the entire system, comparing plant flow charts with the calculated theoretical base flow. In large systems where flow records for pump stations are available and specific problem areas are suspected, a subsystem analysis is warranted.

While there is no similar rule of theory for evaluating inflow, generally it is cost effective to eliminate inflow sources.[4] Sealing manhole covers, patching cracked lines in creek bottoms and disconnecting illegal roof drains can eliminate significant sources of inflow at relatively low cost. Grouting, slip-lining, or replacing line to eliminate inflow, on the other hand, can be expensive.

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[1] Infiltration is defined as water entering a sewer system from the ground through defective pipes, pipe joints, connections, or manhole walls. Inflow refers to water which enters the sewer as a result of rainfall through direct connections with stormwater systems.

[2] The procedure for conducting an I/I analysis is clearly outlined in EPA's "Handbook for Sewer System Evaluation and Rehabilitation", December, 1975.

[3] EPA, "Infiltration/Inflow Program Guidance", Program Requirements Memorandum No. 78-10, March 17, 1978.

[4] Robert Jones and Donald Nelson, "Getting the Most Out of an Infiltration/Inflow Analysis", Public Works, Vol. 106, pp. 51-62.

Thus, by employing EPA's rule of thumb, or simply an estimate of the extent of I/I (as a percent of total system flow), a good indication of sewer system condition can be ascertained.

Other performance indicators, while not absolute standards per se, can be analyzed over time to ascertain changes in system condition. Two indicators measuring incidence of system failure can be viewed from this perspective:

1. The number of sewer back-ups or stoppages.

2. The number of sewer line breaks or failures.

A stoppage is defined as a flooding incident in which waste water either overflows from a manhole or backs up into a home or business.[1] Stoppages are caused either by inadequate storm drainage during periods of heavy rainfall, or by actual physical debris which clog the pipe. Sewer line collapses or breaks occur when there is a structural failure caused by improper pipe bedding, inadequate pipe protection from suface loads, ground movements due to weather (frost) or soil conditions, heavy root growth, faulty joints or tapping of the main for a house connection.

A third measure -- evidence of high concentration of hydrogen sulfide and the related formation of sulphuric acid, which corrodes pipe surfaces -- also suggests inadequacies in system performance attributable to:

1. High levels of BOD (biochemical oxygen demand), or strength of sewage caused by high demand on system capacity.

2. Inadequate velocity of flow caused by physical impediments in the pipe or pipe size (oversized pipe for current usage).

3. Inadequate ventilation.

4. Concentration of sulfates in the water system.

4.3 Factors Affecting Condition

Performance of the sewer system is a function of many variables including age and material of the pipe, pipe size, local ground conditions, pipe installation and maintenance practices over time. Each of these factors is discussed briefly below:

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[1] "Sewers...the Cleaner, the Better...", American City and County, April 1978, p. 46.

A. Age and material of pipe. Sewer pipe is generally made of one of four materials. Smaller diameter pipe is often made of clay (terra cota), a chemically inert material which is not susceptible to corrosion by hydrogen sulfide or other acids. Other materials frequently used are cast iron or steel, asbestos cement -- a material which came on the market after World War II, and concrete, frequently used in the construction of large pipe. Plastic pipe, a relative newcomer to the field, resists chemical and biological corrosion. Currently manufactured in smaller diameter pipe, plastic sewer pipe also serves as an insertion liner in deteriorated sewers. Many large diameter pipes are being lined with epoxy coatups.

The useful life of a sewer is generally estimated between 50 to 100 years and replacement cycles could be based on this rule of thumb.[1] Many cities with older infrastructure systems such as Baltimore have pipe that dates from the turn of the century.

While age of the pipe per se may not always be correlated with deterioating condition, older pipe is apt to be more susceptible to other factors causing deterioation (infiltration and inflow, ground conditions, etc.).

B. Size of pipe. While the size of pipe typically varies with the type and number of expected users, small diameter pipe installed under different patterns of usage and capacity considerations can present problems in terms of blockages and backups.

C. Ground conditions. Sewers constructed in poor soils may settle, loosening joints and creating cracks in the pipe. Chemicals in the groundwater, such as sulfates and organic acids may attack pipe and joints. Ground movements caused by weather (frost, thawing), inadequate protection from heavy surface loads and tree root intrusions in sewer joints are other ground-related causes of sewer pipe deterioation and ultimate collapse.

D. Infiltration and inflow. The presence of infiltration and inflow entering the system through faulty joints, connections and manhole walls is a major cause of pipe deterioation which may ultimately lead to sewer pipe collapse.

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[1] Black and Veatch, a sanitary engineering firm, indicated as a general rule of thumb that larger diameter pipe (18 to 24 inches) should last approximately 100 years, while smaller pipe may only last 75 to 80 years.

E. Pipe installation. Faulty pipe installation due to improper pipe bedding, faulty or poorly sealed joints is often the cause of subsequent pipe deterioation and failure.

F. Maintenance practices. As a spin-off of the Federal construction grants program, much has been written about appropriate operating and maintenance procedures at treatment facilities. There are essentially three types of maintenance:[1]

1. Preventive -- periodic tasks of care and inspection scheduled to prevent a breakdown or prolong the life of equipment (e.g., lubricating and adjusting equipment, replacing worn parts, renewing corrosion protection and the like).

2. Corrective -- unscheduled tasks required to restore equipment to operational status after a breakdown or impending failure is discovered.

3. Overhaul -- complete disassembly and reconditioning to like-new status.

There is no standard practice with respect to preventive maintenance for the collection system. The following are commonly employed practices which help to maintain sewer line condition:

A. Sewer line inspection by in-line photography or closed-circuit TV and smoke detection to determine sources of infiltration and inflow.

B. Sewer line repairs including grouting of leaky joints and manhole repair or replacement.

C. Routine cleaning of pipe either by flushing, jetting, or rodding the system and, in some cases, lining the pipe with plastic.

D. Minor replacement of small segments of pipe.

Spending outlays over time on pipe replacement and maintenance activities per mile of sewer (exclusding house connections which are usually not the responsibility of the sewer department) can also help to provide a handle on the adequacy and continuity of replacement and repair activities.

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[1] Donald Sarquet and David Rudich, A Planned Maintenance Management System for Municipal Wastewater Treatment Plants, for EPA, November 1973, p. 9.

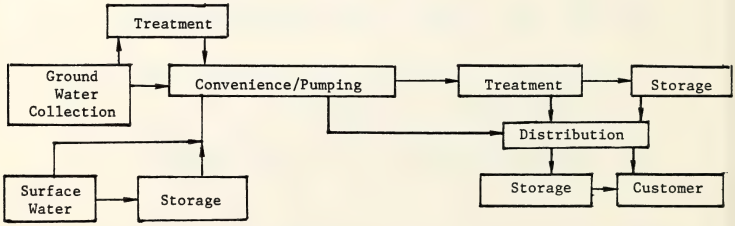
5.0 WATER SYSTEM

5.1 System Description

Water systems are composed of two major elements -- supply and treatment facilities and the distribution network. The supply system includes water sources, storage facilities, such as reservoirs and storage tanks, and treatment facilities for water purification and the intakes, pumping stations and transmission mains necessary to collect and transport water to the treatment plant or distribution system. There are essentially two sources of water supply, ground water sources, including wells and springs, and surface water sources, including lakes, streams, and rivers. Minimum treatment usually consists of disinfection and more extensive treatment may involve the application of various chemicals and filtration.

Since water is supplied under pressure, pumping or lift stations are required to force the water into the distribution system from collection and treatment points. Often, the supply has to be repumped to maintain adequate pressure in elevated areas or outlying regions.

The distribution system itself is composed of main lines and appurtenances. Distribution mains carry the water from storage or treatment facilities through the street system to individual customers who are reached through service connections. Appurtenances include valves, fire hydrants, and water meters. A system diagram is provided below:



5.2 Performance Standards

Similar to sewer systems, standards are more clearly defined for water supply as opposed to the distribution system. There are two main concerns regarding performance of the supply and treatment system:

(1) adequacy of the supply source and storage facilities; and (2) water quality and need for treatment. Supply system adequacy is measured by comparing minimum safe daily drought period yield (in MGD) of the supply source, treatment and pumping capacity with estimated average and peak day demand (in MGD).[1] A ten year planning horizon is suggested for estimating demand.

The Safe Drinking Water Act of 1974 established EPA responsibility for setting minimum drinking water treatment standards. The regulations promulgated in 1975 set standards regarding maximum contaminant levels for organic and inorganic chemicals, coliform bacteria, turbidity and radioactive substances. States are the primary enforcement authorities. EPA regulations have been recently proposed (1978) for the control of organic chemical contaminants in water including: 1) trihalomethanes such as chloroform which result for chlorination; and 2) synthetic organic chemicals associated with industrial pollution and urban and agriculture runoff. While water supply should not contain any noticeable color, taste, or odor of objectionable nature, many of the substances which cause these conditions are not banned by regulations, but rather are treated as a result of consumer complaints. For example, the presence of red water condition -- the reaction of sulphates acting on cast iron pipe -- while not toxic, frequently required treatment to mitigate customer objections.

The primary performance concern regarding the distribution system is the ability to deliver adequate quantities of water as required by industry, fire protection and domestic use at pressures which will not allow ground water to enter the pipe. Although EPA standards have not been mandated for the distribution system, two organizations have had considerable influence in terms of establishing performance guidelines. The Insurance Service Office (ISO), a private for-profit company which conducts Municipal Fire Protection Surveys to assist insurance companies in rate setting, gives condition of the municipal water system a 40 percent weight in terms of its overall assessment.[2] In evaluating performance of the water system, ISO considers the following factors:

- Adequacy of supply based on a comparison of safe yield (i.e., supply in MGD during a severe drought) with average daily consumption.

- Reliability of supply -- the likelihood of supply interruptions.

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[1] "Action Now: For Water System Improvements", Willing Water, AWWA, Inc., Vol. 15, No. 5, May 1971, pp. 2-16.

[2] Insurance Services Office, Grading Schedule for Municipal Fire Protection, Municipal Survey Service, New York, 1973.

- Pumping capacity and power.
- Adequacy of mains -- if mains are cleaned but unlined, ISO may lower the rating since rapid capacity loss can be expected.
- Reliability of mains based on the ability of the system to deliver required flows at required pressure and existence of supplementary mains to handle supply if breaks should occur.
- Size of mains -- in residential districts mains should be at least 6" in diameter -- in commercial districts, 8" or larger.
- Require fire flow.
- Pressure -- minimum acceptable pressure in the main system near the source of hydrant flows should be 20 psi (pounds per square inch).[1]
- Adequacy of hydrants and valves.

The rating system is composed of 10 grades with "1" being the highest which no jurisdiction has achieved. Only about 55 to 60 cities have a grade of "2". In evaluating ISO ratings, however, it should be kept in mind that ISO standards are highly controversial and have recently been criticized as arbitrary and out-dated.[2] The American Water Works Association (AWWA) has also developed standards regarding water system equipment specifications and management practices.[3]

Two other performance indicators, the metered ratio and the Hazen-Williams Coefficient, measure the problems of leaks and of pipe capacity loss, respectively. These are major problem areas in many water systems. The metered ratio computes the ratio of water sold to water produced. The amount of water loss can be attributed not only to leaks, but also to authorized non-metered usage such as firefighting, street and sewer flushing as well as faulty meters and cross connections.[4] Given these caveats, metered ratios of less than 80 to 85 percent (or estimates of "water unaccounted for" whch exceed 15-20 percent) are cause for concern, as a general rule of thumb, for fully metered systems with good maintenance programs and average conditions

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[1] AWWA suggests 30 psi as a more desirable minimum for normal residential requirements. Pressures exceeding 80-100 psi should be avoided as they exacerbate main leakage and breaks.

[2] Homer Porter, "ISO: Taxation Without Representation", Building Standares, May-June 1978, p. 102.

[3] AWWA publishes a series of publications on standards (e.g., AWWA Standared for Steel Water Pipe 6 Inches and Larger) and manuals on water supply practices.

[4] Cross connections represent illegal physical connections to the water distribution system.

of service[1] and should require a leak survey. However, for a system with high variable pressures, in which leakage is difficult to detect and remedy and the pipe system is extensive and old, a higher amount of water unaccounted for may be acceptable. Leaks themselves are a function of age, condition, and length of the pipe, ground conditions, and pressure as well as faulty pipe installation. The judgment as to the amount of leakage which is permissible depends on an analysis of the trade-off between the cost of producing the wasted water versus the cost of pipe replacement and/or costs of other means of leak elimination such as clamping joints. Since pipe replacement is so expensive, few utilities replace significant mileage of main solely because of leaks.2

The Hazen-Williams coefficient measures pipe capacity loss due to tuberculation (sedimentation and incrustation on pipe surfaces). The extent of tuberculation is a function of pipe age and material (metallic unlined pipe being most susceptible), water source (soft water, prevalent in the East, is a major problem) and flow velocity. For new pipe, the Hazen-Williams coefficient is typically 130, up to 140 for larger diameter pipe. Once the coefficient drops to 100 (a 25 percent loss of initial capacity), the rate of decline increases quickly to a coefficient of 70 or less (a 50 percent loss of initial capacity).[3] According to one industry spokesman,[4] cleaning the pipe provides only short-term improvement of up to five years before the pipe returns to its prior condition, while cleaning and lining with cement can extend the useful life of the pipe for up to another 100 years. In most cases, replacement of the pipe is not required unless the main is too small to clean or line economically, or unless the main also has inadequate hydraulic capacity.[5]

Other indicators of system condition offer less standardized measures of performance. Similar to the sewer system, measures of system failures can be analyzed over time to ascertain changes in performance. Most cities keep records on the number of water main breaks and some correlate these with size of pipe, type, and cause of break. Among large cities, the median number of water main breaks per 1000 miles of main is about 100.[6] Breaks are attributable to age of the pipes, particular

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[1]American Water Works Association, Water Distribution Training Course, AWWA, Denver, Colorado, 1962, p. 11

[2]"Replacement of Water Distribution Mains", Committee Report, Journal AWWA, Vol. 61, No. 9, September 1969.

[3]Raymond International Builders, The Centriline Process, Oakland, New Jersey, pp. 3-4.

[4]Conversation with representative of Raymond International Builders, a Division of Raymond Internationa.

[5]John J. Stacha, "Criteria for Pipeline Replacement", Journal AWWA, May 1978, p. 258.

[6]Sol Galler, "City Plans to Combat Water Main Break Problems", Public Works, October 1978, p. 88.

materials and construction, vibrations from traffic, corrosion (in metallic pipes) and pressure. Age per se is not strongly related to the incidence of breaks; however, pipe and jointing materials frequently used in older pipe are more subject to deterioration than newer materials. Breaks may be concentrated in particular types of pipe (i.e., cast iron pipe experiences frequent breaks) and sizes of pipe (generally smaller diameter pipe). Street and traffic conditions as well as pressure rates exceeding design specifications are frequent causes of main breaks.

5.3 Factors Affecting Condition

Water system performance is a function of age and material of pipe, local ground and water conditions, traffic and street conditions, pressure, pipe installation and maintenance practices over time. Each of these factors is considered briefly below:

A. Age and material of pipe. Most commonly used pipe materials include cast iron, asbestos-cement, steel, plain and prestressed concrete and now plastic pipe, a relative newcomer which is being tested and installed in smaller diameter pipe lengths. Cast iron is commonly used for the smaller line and typically offers about 50+ years of trouble free service. Reinforced concrete is used for larger transmission and distribution mains (greater than 16 inches in diameter) given its characteristics of strength and durability. Concrete pipe is estimated to have an average service life of about 100 years. Despite these averages, there are many examples of pipe in good functional condition after more than a century of service suggesting that age per se is not always an indicator of pipe condition.

B. Ground and water conditions. Ground shifts caused by weather conditions (frost penetration below expected levels; soil heaving caused by thawing) and ground settling caused by poor soil conditions are both causes of pipe cracking and ultimate collapse.

   Local water conditions also affect pipe condition. Chemical treatment of the water supply and the pressure of soft water conditions both result in deposits on interior pipe surfaces, ultimately causing corrosion and increasing the incidence of main breaks.

C. Traffic and street conditions. Continued vibrations from heavy traffic as well as building construction (i.e., driving of foundation piles) can result in pipeline cracking and failure.

The situation can be exacerbated by inadequate pavement surfaces. Frequent street cuts and inadequate patching exposes subsoils to erosion, ultimately undermining the mains, leaving them unsupported and susceptible to unplanned stress.

D. Water pressure. Steady pressures exceeding design specifications and/or sudden variations in pressure place extra stress on pipe walls and joints weakening the structure.

E. Pipe installation and maintenance practices. Pipe installation including proper bedding, laying and jointing of pipe can have an important effect on the extent of trouble-free service life. While preventive maintenance standards have not as yet been established for water systems, the following maintenance practices are commonly employed to maintain main line condition:

1. Pipe cleaning and lining to restore pipe capacity.

2. Leak surveys involving the installation of flow measuring equipment and listening devices.

3. Pressure and coefficient surveys to ascertain adequacy of flow and capacity.

4. Repairs to, and replacement of, deteriorated pipe, valves, hydrants and meters.

Spending outlays over time on pipe replacement and maintenance activities per mile of line (excluding house connections) also provide a measure of the adequacy and consistency of system repair and replacement.

6.0 MASS TRANSIT

6.1 System Description

There are essentially three types of mass transit systems that service cities: 1) bus systems; 2) light rail systems which refer to a streetcar-type transit vehicle railway constructed on city streets and/or private right-of-way; and 3) heavy rail systems which refer to a subway-type transit vehicle railway constructed on exclusive right-of-way. Commuter railroads have been excluded from consideration since their service areas extend beyond city limits and often involve non-local jurisdictional authorities and financing.

Bus systems are composed of the bus fleet itself, storage and maintenance garages and frequently, bus shelters and signage. Bus mileage travelled per annum is generally computed in total bus miles (number of miles travelled times number of buses). There are essentially two types of buses: 1) the current design bus, a conventional bus of which GM's "New Look" bus introduced in 1959 is the classic model; and 2) the new generation advanced design bus, constructed of lighter materials such as aluminum and stainless steel, by two manufacturers -- GM and Rohr Industries' Flexible Division. UMTA (Urban Mass Transit Administration) has proposed criteria for a new advanced design bus -- the "Transbus" prototype -- but high production costs as well as manufacturer objection to certain of the design elements[1] have resulted in postponement of the decision to mandate the Transbus specifications for Federally-assisted bus purchases.

Rapid rail systems are composed of transit vehicles, track and structures including stations, tunnels and elevated structures, and other equipment including power, signalization and fare collection equipment. Transit mileage travelled is often computed in vehicle miles, that is, when vehicles are operated in trains, each vehicle is counted separately (e.g., an eight vehicle train operating for one mile equals eight vehicle miles).

Funding is available from the U.S. Department of Transportation Urban Mass Transportation Administration (UMTA) for public transit systems to finance capital equipment purchases. The 1973 amentments to the Urban Mass Transportation Act increased the matching share for Federal aid to 80 per cent. Secion 3 funds, as the capital grant program is called, are provided on a discretionary basis for bus purchases, rail modernization projects and the construction of new transit systems. Funds are also available to finance transit capital expenditures under Section 5 of the

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[1] Public Technology, Inc., New Standard Bus Equipment, Urban Consortium for Technology Initiatives, October 1976, pp. 9-10.

Act, the formula grant program,[1] and additionally, from the urban systems portion of the Federal-aid highway program and from Interstate "transfers".[2]

6.2 Performance Standards

Performance standards are a frequent topic of concern in discussions of mass transit facilities. While operating performance standards have been developed for particular types of transit systems (e.g., vehicle operating speeds and headways, route coverage, etc.), there are no well defined comparable criteria on which to measure the physical condition of the capital stock. Instead, one must use industry rules of thumb as well as observable performance measures to infer system condition.

There are two frequently cited measures of system performance:

1. Number of vehicle breakdowns, defined as occurrences which require service calls to repair vehicle mechanical failures; and

2. Percent of vehicle down time, defined as the average number of transit vehicles (out of the total fleet) out of service at any one time for maintenance and repair.

The first measure is often calculated in terms of the average number of miles travelled between breakdowns. As the age of the fleet increases, the number of miles travelled between failures typically decreases.[3] In its design specifications for Transbus, UMTA established a mileage goal of 20,000 mean miles between road calls.[4] For the second measure, UMTA officials suggest as a rule of thumb that vehicle down time of greater than 10 to 12 percent reflects a problem situation.[5]

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[1] Section 5 funds are allocated to urban areas on a formula basis. Local officials can decide whether or not to use funds for capital projects or to help cover transit operating deficits. So far, an average of only 6 percent of formula grant funds has been used for capital projects.

[2] Urban areas can decide to build transit facilities instead of non-essential urban Interstate segments.

[3] This phenomenon has been confirmed in discussions with local transit officials who operate aging fleets.

[4] Bus and Paratransit Technology Division, Transbus Procurement Requirements, UMTA, August 1978, p. II-12.

[5] Conversation with the Capital Grants Division, Department of Transportation Urban Mass Transportation Administration.

Standards of vehicle maintenance have also been established by equipment manufacturers and form the basis for warranty coverage. Vehicle maintenance including minor and major overhauls should be conducted at regular intervals on a time or mileage basis. Looking at individual transit system practices, keeping in mind the different maintenance requirements of specific vehicle types, it should be possible to determine with what frequency systems are performing essential maintenance activities.

6.3 Factors Affecting Condition

Transit system conditions are a function of several variables including age and type of vehicle, average annual vehicle mileage, weather and local road conditions, levels of investment and maintenance expenditures and practices. Each of these items is discussed briefly below:

A. Vehicle age and type. Industry experts concur that age of transit vehicles correlates with deteriorating vehicle operation and increasing maintenance expenditures.[1] To determine the optimal useful life of a transit vehicle, a cost-benefit analysis should be performed to compare the expected operating (including maintenance), depreciation and interest costs of keeping the vehicle with the expected costs of replacement. As an average rule of thumb, the useful life of a motor bus is generally estimated at between 12 and 15 years. At least one major overhaul should be conducted during this period, typically after 250,000 miles, or 6 years of travel, assuming average annual per bus mileage of 40,000 miles. Rapid rail cars have a longer estimated useful life -- between 20 and 30 years for some of the older equipment.[2] Overhaul of the motors and control systems are generally conducted on a 6 year cycle.

   Estimates of useful life vary as a function of vehicle type. Transit operators maintain that newer buses and subway cars incorporating newer lighter materials and more complex operating equipment (air conditioning, wheel chair lifts on buses, etc.), may experience shorter service lives and require higher maintenance expenditures.

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[1] Jose Gomez-Ibanez, Federal Assistance for Urban Mass Transportation, a Ph.D. thesis, Harvard University, January 1975, p. 277.

[2] Useful life estimates for both bus and rail were provided by a variety of sources, including UMTA officials and representatives of the American Public Transit Association (APTA).

Two other factors affect vehicle replacement cycles: 1) aesthetic considerations; and 2) Federal capital grant programs. Old subway cars, for example, may still be serviceable, but ridership demands (for air conditioning or facilities for the handicapped) may make them obsolete.[1]

B. Vehicle utilization. Transit vehicle condition is also a function of vehicle use. Estimates of useful life are generally based on assumed average annual vehicle mileage of between 40,000 and 50,000. Frequently, older vehicles are less heavily utilized. In the bus industry "trippers" refer to older motor buses which are primarily operated during peak service hours.

C. Weather and street conditions. Climate affects transit vehicle and track condition. Northern climates are again problematic because of road salting and its corrosive effects. Street conditions also affect motor bus wear and tear. Rutted and potholed roadway surfaces and traffic congestion have an adverse effect on vehicle clutch and brake wear.

D. Investment levels and maintenance practices. Outlays on vehicle replacement and maintenance activities provide a good indicator of the level and continuity of system upkeep over time. According to the American Public Transit Association (APTA), maintenance expenditures for the transit industry currently average about 22 percent of total system expenses.[2] While maintenance practices vary somewhat across systems, the following represent a typical list of maintenance activities:

1. Vehicle Maintenance
   - mechanical overhauls
   - body work
   - wheel maintenance -- inspection for cracks, wearing, etc.
   - brake repair
   - oil changes

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[1] William Tye analyzed the issue of premature replacement in his Ph.D. dissertation, The Economic Costs of the Urban Mass Transportation Capital Grant Program, Harvard University, 1969, and developed an optimal model of bus replacement. Unfortunately, he did not test actual property behavior to determine if, in fact, transit companies are retiring the fleets prematurely as a result of Federal capital assistance.

[2] APTA, Transit Fact Book, 1977-1978, p. 19.

2. General Maintenance (for rapid rail systems)
   - track repair and minor replacements
   - structural repairs to tunnels, elevated structures, etc.
   - repair and overhaul of power and signalization equipment.

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APPENDIX F: A HISTORY OF PUBLIC WORKS IN THE UNITED STATES, 1790-1970

A HISTORY OF PUBLIC WORKS

IN THE UNITED STATES

1790-1970

by

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TABLE OF CONTENTS

Page

LIST OF TABLES IN TEXT iii

LIST OF TABLES IN APPENDIX v

EXECUTIVE SUMMARY vi

INTRODUCTION 1

Chapter

I. THE RELEASE OF PRIVATE ENERGY: 1790-1873 . . 4

Geography and Philosophy
Transportation and Discovery
Federal Public Works 1790-1850
State and Municipal Efforts to 1860
National and Local Projects 1850-1873
Significance of Public Works to 1873
Accommodating Urbanization to 1860
Urban Living
Rise of Mass Public Education
Growth of Public Water Systems

II. RISE OF THE CITIES: 1874-1932 28

The Eclipse of Federal Public Works
Growth of State and Municipal Public Works 1870 on
Education up through World War I
Water Supplies and Sewerage Systems
Urban Transportation Systems
Improving the Cities' Streets and Other Items
The Construction Boom of the 1920s

III. EMERGENCE OF THE FEDERAL GOVERNMENT 1933 . . 49

New Deal Public Works
The Growth of Federal Conservation and Development

TABLE OF CONTENTS--continued

Page

Impact of Federal Public Works in the 1930s
World War II
Consequences of Federal Wartime Construction
From World War II to 1960
Return to Normalcy, 1945-1950
Conservation and Development in the Postwar Period
Korea, The Baby Boom and the Interstate Highways, 1950 on
To the Present: Summary and Conclusion

APPENDIX TABLES 76

NOTES 100

LIST OF TABLES IN TEXT

Table		Page
I	Cumulative Turnpike Construction in New England and Middle Atlantic States, 1810-1830	11
II	Investment in Canals, by Region and Agency of Enterprise: 1815 to 1860	17
III	Educational Expenditures, 1840-1860	25
IV	Federal Construction, 1869-1928	29
V	Federal Non-Military Capital Assets, Continental United States, 1902-1932	30
VI	Bureau of Reclamation Construction, 1915-1951 . .	33
VII	State and Municipal Construction, Various Years, 1870-1932	35
VIIa	Municipal Government Capital Assets, Selected Years, 1902-1930	36
VIII	State and Municipal Expenditures on Primary and Secondary Education, 1870-1920	37
IX	Urban Water Filtration Systems, 1880-1910	40
X	Municipal Expenditures on Sewers and on Water Filtration Systems, 1881-1910	42
XI	Public Works in the Great Depression, 1930-1938 .	51
XII	Regional Impact of Federal Public Works, 1935-1938	54
XIII	Total Cost of New Construction and P.W.A. Aid, Sewer and Water Works, 1933-1937	56
XIV	World War II and the Composition of Public and Private Construction, 1940-1945	60
XV	Industrial Facilities Expansion, July 1940-June 1945	63

LIST OF TABLES IN TEXT--continued

Table		Page
XVI	Concentration of Privately Operated, Government Owned Facilities' Expansion, June 30, 1944 . .	64
XVII	Regional Distribution of Public and Private Construction, 1939-1946	65
XVIII	Sales of Large Industrial Plants During the Second and Fourth Quarters, 1946	67
XIX	Trends in the Share of Government and of Federal Government in Construction, 1920-1970	69

LIST OF TABLES IN APPENDIX

Table		Page
I	Percentage Shares of Government in Total Reproducible Wealth, U.S.	77
II	Five Year Moving Averages of Government Gross Construction, Current and 1929 Prices, 1869-1955	78
IIa	Five Year Moving Averages of Government Net Construction and Depreciation, Current and 1929 Prices, 1869-1955	83
III	Public Construction and Some of its Components (millions of current dollars, 1915-1970) . .	87
IV	Public Construction and Some of its Components (millions of 1957-59 Dollars, 1915-1970) . .	90
V	Federal Expenditures for Rivers and Harbors: 1822 to 1970	93
VI	Distribution of Government Gross Capital Formation, Current Prices between Federal, State and Local, 1869-1955	94
VII	Shares of Federal and of State and Local Government in Government Construction 1915-1970	95
VIII	Financing State and Local Construction, Selected Years, 1902-1958	98

EXECUTIVE SUMMARY

Public works are easier to describe than to define. And for historians concerned with the evolution of public works over long periods, definition is especially troublesome. For what is public in one era may not be so in another. In this study, public works are defined according to the standards of the period under consideration. This takes the past on its own terms, and it is the only way to allow a history of public works to speak what must be its major message--that public works in America constantly evolve. As each age faces different possibilities and problems, so each defines a different scope for the public sector.

This essay divides public works history into three time periods--the years to 1873, from 1874-1932, and from 1933 to the present. It is a useful oversimplification to think of these epochs as corresponding roughly to early, developing, and mature capitalism.

The Release of Private Energies, 1790-1873

In the early years of the Republic, until the early 1870s or so, public works were broadly defined. Under the circumstances, they had to be. Distances were vast and sparsely settled, resources undiscovered, and business institutions and capital markets underdeveloped. Faced with such conditions, American leaders stressed a positive role for state action. Public works would be developmental in nature; they would lead private enterprise and in so doing would "release private energies."

Early public works were dominated by problems of transportation and discovery. Due to state and sectional rivalries, Federal activities were modest until the 1850s, but still included road, lighthouse, and harbor construction, surveying, and the subsidization of private railroads and canals. In the two decades after 1850, the sectional rivalries were surmounted, and Congress provided massive aid to such private works of national importance as the Illinois Central and the transcontinental railroads.

States and cities played a larger role in the transportation revolution than did the Federal government. Road building was an early enthusiasm until it was largely eclipsed by canal mania. About 73% of all canal expenditures before

1860 were publicly financed and many canals were public enterprises. Early railroads were also sometimes state ventures, and in the years before the Civil War about 24% of total railroad construction was publicly financed.

Other public works included banks--as a response to the capital shortage--geological surveys to discover the nation's resources, and water works and schools.

Water supplies in Colonial cities had been private businesses, but explosive urban growth revealed their defects. Shortages, disastrous fires, and repeated epidemics all combined to convert municipal water systems into public works. The response to these problems was slow, however. Philadelphia, New York, Boston, Chicago, and a few other cities constructed water systems in the antebellum years. Most other large cities and virtually all small cities failed to respond until, in the postwar years, the need became overwhelming.

Rise of the Cities, 1874-1932

The 1870s mark a period of transition in the history of public works. Federal activities dwindled, and with the growth of large private enterprises, transportation largely ceased to be a public work. Urban public works continued to expand until they dominated public construction and led to a rise in the fraction of all construction which is public, which began in the late nineteenth century. Finally, public works shifted from projects designed to lead private economic development to activities which would clean up the social costs of private urban development.

State and local public works rose sharply in the late nineteenth century, almost surely due to the activities of the cities. From the 1870s on, about a fifth of state and local spending went into capital formation which rose from less than 1% to well over 2% of GNP by the 1920s. The sources of urban public works represented a continuation of trends evident well before the Civil War. More cities were forced to construct water works and filtration systems. Most cities built some sort of integrated sewer system. And paved streets, which had been a rarity in antebellum times, were the largest single construction expense for most cities. About a quarter of all state and local spending went for education from 1870 on.

During the decade of the 1920s, the historic concern with transportation was reasserted and the role of the states in public works--which had been minimal since the 1840s--also

rebounded. Both these changes were attributes of the great road building boom which engulfed the 1920s.

Road and school building dominated public construction during the 1920s. Although road construction was largely financed by user taxes, school and other public construction benefitted from easy access to capital markets. State and local debt income ratios remained well over two--a level they have not attained since World War II.

The Emergence of the Federal Government, 1933 on

The Great Depression and World War II are a watershed in the history of public works for four major reasons. The expansion in public construction meant its impact was greater than at any time since the 1840s. The Federal role became paramount for the first time. The kinds of investments considered public were broadened. New justifications for public works, such as the relief of mass unemployment, were accepted.

States and localities had been the major source of public construction during the 1920s. Faced with declining tax revenues and a collapsing bond market, they cut construction spending sharply after 1931. As Federal public works grew they therefore came to account for 60% to 65% of public works and nearly a third of all construction from 1933-1938.

The most enduring monuments to New Deal public works were the great multiple purpose river development projects such as Bonneville and Grand Coulee dams, and TVA. They helped tilt the regional distribution of public works to the South and West and represent the first Federal attempts at regional planning since the completion of the transcontinental railroads.

New Deal public works were never on a scale large enough to cure mass unemployment, and World War II brought them to a halt. Yet the war induced a vast expansion in other kinds of public works, most notably Federally financed industrial construction. Between 1940 and 1945, the Federal government constructed about $17 billion of new industrial plant and equipment, some $11 billion of which was considered useful for civilian purposes when the war ended. Together public and private investment amounted to half the gross book value of all manufacturing assets in existence in 1939. In no previous period had manufacturing capital been accumulated in such a burst, and 57% of it was built at Federal expense.

Except for residential housing, other public works were sharply curtailed by the war, as was all private construction. Yet World War II, the most expensive conflict in history and accompanied by detailed controls designed to restrict private construction, resulted in a smaller shortfall in private building than had the Great Depression. Government regulation, it seems, is not always a worse threat to private capital accumulation than is free enterprise.

With the end of World War II, public construction very quickly returned to "normal." The first postwar decade (1946-1955) shows a government share in construction that is only two percentage points above the 1920-1929 level. By the middle 1960s, public works accounted for about 28% of all construction, and during the 1970s, the public share declined. Similarly, the project composition of public works is also limited to traditional kinds of activities. From the 1950s on, school construction, sewer and water works, and especially road construction have continued to dominate public works.

Yet to conclude that public works are declining in relative significance and are largely composed of traditional projects would be highly misleading. There is an increasing discrepancy between what we call public works and what we actually treat as activities affected with a public interest, and this latter category has expanded rapidly in the recent past. This growth in those activities which we treat as public works has occurred for essentially two sorts of reasons.

First, an increasing number of previously private activities have come to be affected with a public interest. Workplace safety and health, and air and water pollution are two obvious areas where a public interest has recently been asserted. One result is an increasing volume of publicly mandated private investments in health, safety, and environmental quality--all public works by any reasonable definition. It is a gross but useful oversimplification to say that prior to 1870 we treated private investments as public works and subsidized them. Later we made public many of the costs of private economic development with publicly financed public works. Now we force private enterprise to internalize its own costs with privately financed public works.

A second set of reasons has also contributed to the blurring of the public and private sectors. Nineteenth-century belief emphasized the desirability of a balanced public budget. It was also widely thought that a market determined distribution of income was equitable, and that private investments should have to pass a market test.

Since the 1930s, each of these beliefs has eroded. Public works financed through deficits are justified by their impact on employment. A variety of unprofitable activities are subsidized even if there are no obvious social benefits because they are somehow worthy of public support or because those who undertake them are especially worthy of public aid. Federal subsidies in 1970 amounted to at least $63 billion. Most support a current economic activity, but in so doing, they must also shape the rate and direction of "private" investments.

We have come full circle since the eighteenth century. The broad concept of public works which was then current eroded during the late nineteenth century. Since the Great Depression public works as conventionally defined have seen a relative expansion. But there has been an even larger growth in publicly mandated private investments and in public subsidy programs. Neither of these is a public work in the traditional definition. However, both result in works which it is apparently thought in the public interest to encourage.

INTRODUCTION

There is no unique group of projects which always were and always will be public works. Economists try to define them in abstract and technical terms as public goods--goods with beneficial neighborhood effects, or goods where the exclusion of free riders is impossible or inefficient. But it is hard to pour history into this mold.

Politicians are often equally presenticentric, but in a different way. Public works are roads, schools, sewers, and waterworks. In short, they are coterminous with the set of projects which governments presently build and own. But this ignores the fact that these projects change over time, and it misses all the semi-public works which in various ways governments encourage the private sector to construct. In short, it is a bad guide to history and probably no guide at all to the future.

An economic historian would want to see public works in yet a third way. The economist's criterion for public goods is a good starting point: public works are by definition governments' responses to perceived market failures. But what is defined as a market failure, and the ways in which markets fail, may differ in different historical epochs. And the responses of people and their governments change too, for political and ideological and other reasons. So what is a public work, and the reason that it is public, and what level of government undertakes it, and how it is done, are all questions to which varying answers have been supplied during the past 200 years of American history. That is a point worth noting. Historical analysis can prevent us from falling into either the economist's or the politician's trap. Discovery that public works have included differing projects and have been proposed for different reasons may not be a road map for the future, but it is a warning that the present is ephemeral.

This essay divides public works history up into three broad time periods--the years to 1873, from 1874-1932, and from 1932 to the present. It is useful to think of these epochs as corresponding roughly to early, developing, and mature capitalism. Of course, continuities do exist between the periods, and the precise breaks are neither exact nor necessarily identical for all levels of government. Still, major changes do take place, and periodization is one way to highlight them.

During the early period of American capitalism until about the 1870s, public works tended to be developmental in nature. That is, they were largely intended to overcome capital shortages, especially in key areas of transportation and resource discovery, and they led the economy rather than simply accommodating private demands. The result was that public investments were undertaken in a broad range of activities which later were to evolve into sacred preserves of private enterprise.

By the 1870s, private capitalism was no longer a hot-house flower. Accordingly, public works were no longer largely designed to overcome shortages of private capital and they no longer led the private economy. Yet public works grew in relative importance during most of these years, and evolved into what has largely been their modern form. Industrialism propelled the urbanization of the economy, and public works became increasingly designed to accommodate urban needs and to pay for the social costs of private urban development. Thus waterworks, sewers, schools, streets, etc., came to dominate public construction. While they underwrote private development, they almost never led it; the history of most urban public works during these years is one of too little and too late.

These changes in the kinds of public investments needed by private enterprise led to a contraction of the sphere within which public activities were conceived to run. Increasingly during these years, public works became defined as those activities needed to support private development but which could not be made to yield a private profit.

As in so many other areas, 1932 marks the end of an era in the history of public works. Unemployment became a justification for public construction, and with private development depressed, developmental--"pump priming"--public works again became more significant. Finally, the Federal role for the first time became dominant.

During World War II, industrial construction became conscripted as a public work for the duration. Thereafter, official data seem to suggest that public works have returned to the comfortable categories of the years before 1932. Once again road building dominates public building, while schools, sewers, water works, river and harbor projects--and an occasional space center--are again the standard fare. But the official data are increasingly misleading. As in the ante-bellum decades, governments are encouraging or discouraging via tax and subsidy policies an enormous range of private construction. The public/private distinction which had become

increasingly sharp during the years 1874-1932 is now blurring. Before the Civil War, developmental considerations had led to a downplaying of this distinction. Now, with the income distribution and employment rate coming to be thought of as public goods and with the increasing pervasiveness of neighborhood effects, formerly private activities take on the character of a public work. We have responded partly with public construction, but, as in the antebellum years, mostly with public controls and subsidies of private investments. The gap between what we label public works and what we in fact treat as construction effected with the public interest is becoming increasingly large.

CHAPTER I

THE RELEASE OF PRIVATE ENERGY: 1790-1870

Geography and Philosophy

In September of 1620, William Bradford stood on the deck of the Mayflower and surveyed the coast. It seemed to him a "hidious and desolate wilderness full of wild beasts and willd men."[1] This was not an inaccurate summary, and one which many recent immigrants have affirmed. One hundred and seventy years later, in 1790, the wilderness had retreated but little. The new republic was a European outpost perched on the rim of the continent like the stage set of a Western movie behind which lay a vast and unknown desert.

The founders of the new nation and those who guided its first decades were on the whole remarkably practical men, but they were also learned gentlemen in the eighteenth-century tradition. As such they were heirs to the Enlightenment and they were aware of, and on the whole sympathetic to, the doctrines of Adam Smith. But the older mercantilist notions which emphasized detailed state intervention in the economy for the common good were also part of their heritage. The result was an eclectic intellectual background which was well suited to American conditions.[2]

Geographic and economic circumstances dictated that government would have to play a major role in economic development, if there was to be any economic development. Distances were vast and population widely scattered. Capital was scarce, natural resources largely uncharted, markets for labor and funds underdeveloped, and business organizations small and fragile. Clearly, transportation, communication, and discovery were of vital importance, and by no stretch of the imagination could private enterprise be relied on to supply the necessary capital for them.

Such an assessment was not uncongenial to men reared in a Smithian and mercantilist tradition. Although different individuals drew different policy conclusions from the analysis, most shared a view that positive state action was both necessary and desirable.

Concerns with discovery and exploitation of natural resources, with solving the problems inherent in vast distances, and with augmenting scarce capital were what shaped early state and Federal public works. Exploratory and scientific surveys,

river and harbor improvements, banks, and the promotion of roads, canals, and later railroads, all reflected these concerns. Initially there was little worry that government would conflict with private enterprise, for private capital was scarce and business organizations undeveloped. Instead, government activity was developmental and would encourage lagging private enterprise. This was "constructive liberalism." Government, by building the infrastructure itself, or by aiding in its private construction, could provide a context which would release private energies.[3] Accordingly, such projects were seen as community civic improvements and were part of the great association movement which had led to colonization itself. Government public works would spread development, increase knowledge, democratize economic opportunity, and free men from some of the natural constraints of a new continent.

Constructive liberalism, then, was a blend of European philosophy and American circumstance. It resulted in active government promotion of a wide spectrum of public works down to about 1873.

Transportation and Discovery

Federal Public Works: 1790-1850

From the inception of the Republic vast schemes were regularly proposed to employ Federal resources in promoting economic development. Hamilton's famous Report on Manufactures was one of the earliest, and in it he advocated a national bank, funding the public debt, and tariff protection for nascent manufacturers. Even Jefferson favored Federal support of science and transportation, and his Secretary of the Treasury, Albert Gallatin, produced what was in effect a national transportation plan in 1808 with his Report on Roads and Canals.

Gallatin proposed to spend about $20 million on such ventures. He began his argument with the observation that "the general utility of roads and canals is at this time so universally admitted, as hardly to require any additional proofs." "There are, however," Gallatin noted, "some circumstances which . . . check the application of private capital and enterprise to improvements on a large scale." These obstacles were "the great demand for capital," and the difficulty in mobilizing it for "objects which offer only the prospect of remote and moderate profit." In addition, Gallatin stressed that the utility of a system of transportation was more than simply the utility of its separate projects because of the interconnections

involved. As for the actual benefits of such a system, Gallatin summarized them as follows:

> Good roads and canals will shorten distances, facilitate commercial and personal intercourse, and unite, by a still more intimate community of interests, the most remote quarters of the United States. No other single operation, within the power of Government, can more effectually tend to strengthen and perpetuate that Union which secures external independence, domestic peace, and internal liberty.[4]

The programs of Gallatin and other enthusiasts of Federal public works were honored largely in the breach. The Federal commitment, although neither miniscule nor irrelevant to antebellum economic development, was a far cry from Gallatin's grandiose vision. This was not due to any budding dedication of Americans to free enterprise, however. Nor was it simply a matter of states' rights, although as Jackson's Maysville Road veto showed, Constitutional scruples hindered Federal support for what seemed to be purely intrastate works. But the real difficulties stemmed from the sectional rivalries and jealousies which ultimately led to civil war.[5]

States, as in New England, which had themselves invested heavily in public works were unenthusiastic about Federal taxes to support competing projects in other states, while the South "curse[d] the tariff and internal improvements," which would protect and develop Northern manufacturers at its expense. As a result, Federal public works expenditures were modest in the antebellum decades until this sectional logjam was partly broken in the 1850s.

Transportation and communication were the most important areas of Federal involvement. Roads, lighthouses, river and harbor improvements, scientific surveys, and railroads and canals were the types of projects undertaken. All but the latter two were done largely as Federal projects; canals and railroads were encouraged via Federal subsidy or participation which took the form of stock subscriptions, land grants, and the loan of scientific personnel.

Federal efforts began modestly enough. In 1789, the first Congress authorized the construction of a lighthouse on Cape Henry, Virginia. Surveys for the National Road from Cumberland, Maryland to Wheeling, [West] Virginia began in 1806. A portion was opened by 1813 and maintenance was a problem from the outset. The first of many rivers and harbors bills was passed in 1824, and work was begun on several Great Lakes'

ports. (River and Harbor construction from 1822-1970 is listed in Appendix Table V below.) A General Survey Act was also passed in 1824 which created a board of engineers and authorized them to loan Army engineers to state and private projects of national importance. Engineering talent flowed to these projects in another way. West Pointers kept in touch, and they provided a national network of information on engineering job opportunities. Combined with the Army's liberal leave policy and the relatively high pay of civilian engineers, this network resulted in a regular flow of West Point trained engineers into state and private internal improvements. And during the 1830s, as the first wave of internal improvements crested, this flow became a flood.[6]

Federal surveys began in 1803, with the Lewis and Clark expedition. This and later surveys at both the state and Federal levels were compounded out of military and diplomatic considerations, scientific curiosity and economic utility, but contemporaries uniformly viewed them as internal improvements --as public works designed to create the infrastructure within which private enterprise could flourish. A second western survey, by Stephen H. Long in 1820, returned with valuable scientific information, while geologist David Dale Owen conducted a survey of mineral lands in Illinois, Iowa, and Wisconsin during the late 1830s. The Coast Survey began a somewhat erratic career in 1832, and in 1842, Congress appropriated $25,000 to build the naval observatory.[7]

Besides these efforts, the Federal government continued to build lighthouses after its first venture in 1789. The continuing river and harbor work including dredging of the Mississippi, Ohio, Red, and other rivers, and the improvement of the port of San Francisco in 1850 and New York in 1852. Army engineers built "military" wagon roads in the Western territories, and in 1802 Congress set aside two percent of the land sales from the state of Ohio to build roads in that state. Other new states including Indiana, Illinois, Louisiana, Mississippi, Alabama, and Missouri received three percent of land sales, and most other states received five percent.[8]

Congress supported private activities of public utility with more than just the loan of scientific and technical personnel. In 1824, the Federal government became a capitalist, purchasing $300,000 of stock in the Chesapeake and Delaware Canal Company. Later, in 1828, it bought one million dollars of stock in the Chesapeake and Ohio Canal, making it the largest stockholder in that company. Other companies subscribed to included the Dismal Swamp Canal, and the Louisville and Portland.[9]

Such ad hoc and piecemeal support for state and private ventures, along with continuing Federal public works on a relatively small scale, continued up to 1850. In that year, Congress sharply increased the scale of its aid and established the general location of projects to be subsidized. The story of this increased Federal presence will be told below.

Federal involvement in public works investments to 1850 presently defies an accurate quantitative assessment. Henry Broude has estimated that total Federal expenditures on internal improvements amounted to about 11% of the Federal budget during 1820-1840, and as this does not include various subsidies to state and private projects, it is probably a minimum estimate.[10]

What did the country get for its money? It is in the nature of public works investments that their benefits are hard to measure. Direct Federal construction was small and not designed to remove particularly crucial development bottlenecks. Federal surveys provided valuable scientific and economic information but their developmental impact must have been marginal. Perhaps the single most important Federal contribution was its use of military engineers on "public" works whether built by government or private enterprise. Technical expertise was scarce in antebellum times, and the Corps of Engineers very nearly had a monopoly of it. Had such talent been unavailable during the 1820s and 1830s some projects could not have been built and others constructed more poorly. Nor would these projects have been such valuable training grounds for the junior engineers who went on to build the greater projects of the 1850s and the postwar decades.

State and Municipal Efforts: to 1860

If the importance of Federal public works in promoting economic development up to 1850 must be termed modest, the role of the states, and to a lesser extent, the cities, was central. State and local public works included roads, banks, canals, railroads, scientific surveys, salt works, sewers, public buildings, water systems and more. But while the range of projects is impressive, and testimony to antebellum Americans' willingness to countenance a broad spectrum of government activities, equally impressive is the overwhelming concentration on transportation, discovery and communication.

Nearly every antebellum state supported some sort of geological or natural history survey. The motives behind the surveys were complex, but usually included both scientific and

immediately practical considerations. That the government should be a patron of science for the common good was a conclusion shared by many legislators. But the surveys were also viewed as internal improvements--public works--and when Denison Olmsted began the first state survey in North Carolina in 1823, he was supported by its Board of Internal Improvements with the hope that his findings would be useful in the location of canals and railroads. Similar motives impelled the other state surveys. Knowledge is a form of capital, and the early legislatures supported surveys both as pure science and as economic infrastructure which would complement other elements of the internal improvements movement.[11]

State and municipal investments in transportation reached their zenith in the two decades after 1820. Public support for such activities was broad--although not unanimous--and it rested on a complex of justifications. Public aid to transportation was implied by a general "spirit of improvement" which characterized the early nineteenth century. As William H. Seward put it in 1850: "A great and extensive country like this has need for roads and canals earlier than there is an accumulation of private capital . . . to construct them." Henry Varnum Poor, editor of the American Railroad Journal, was more blunt. "No new people can afford to construct their own railroads," he said.[12]

In addition to the problems of capital shortage and lack of private business skills, was the difficulty that many transportation investments were frankly developmental rather than exploitative in nature, and accordingly, social benefits were expected to outweigh private profitability. In such situations, the state, relying on its superior power to raise capital, and on its powers to tax and grant franchises, could undertake projects where private business could not. In so doing it would support the creative talents of private entrepreneurs in other fields. The final results would be faster economic development and a more democratic society as transport investments cheapened travel for the great masses of people and by stimulating entrepreneurship led to a broader diffusion of wealth.[13]

Less lofty concerns also motivated states and cities to undertake transportation investments. Most important among these were the continuing trade rivalries between states and cities. Pennsylvania (and most especially Philadelphia), Baltimore, New York City and New York State, Boston, and other eastern cities and states, all struggled to capture the trans-Appalachian trade. It was a theme which shaped much of the transportation public works in the first four antebellum decades.

Road construction was among the earliest of state and local public works. Early roads were little but dirt tracks--cow paths--and nineteenth-century travelers are unanimous and eloquent in citing their horrors. Hear one Michigan traveler on his way to Chicago in 1836:

> This has been a very tedious and toilsome journey. Where there were roads they were execrable. . . . If a man were to set about describing bad roads and were to draw upon the powers of the liveliest imagination, he would fall far short of the realities which I have experienced. Sometimes the horses were swimming in the water, sometimes floundering through quagmires. At times, the wagon was all but upset over the stumps of trees.[14]

As a result of these, and worse conditions, a turnpike boom got underway about 1800 and lasted until the early 1830s. Although privately financed state chartered monopolies were the preferred method of construction in New England and most of the middle Atlantic states, in other states roads were either entirely publicly constructed and owned, or else involved public subscriptions to the stock of "private" enterprises. Total turnpike investment in New England and the Middle Atlantic states up to 1830 is shown in Table I below.

Occasionally public investments were considerable. Virginia spent $5 million on road construction before the Civil War, and localities in Ohio may have invested as much as $2 million. The resulting turnpikes, plank roads and other improvements were a boon to travelers but failed to provide truly low cost long haul freight transport. For this, canals and railroads were needed, and government investments in these areas rose sharply during the 1820s.

The real mania for public works began with the Erie Canal. New York state built the Erie to tap the burgeoning trade of the Middle West, because private enterprise was incapable of doing it. Begun in 1817 without the aid of trained engineers, the main line was opened eight years later in 1825 after an expenditure of $7 million.[15]

The Erie was a public work in the epic tradition of the Pyramids, and it captured the imagination of its age as it still does ours. Daring in conception and grand in scope, it was executed largely by amateurs and remains an enduring monument to the common man. During eight years of construction it remained relatively untouched by scandal, and the final product, all admitted, was remarkably well built. And not least of all, it decisively opened up the trade of the Old Middle West

TABLE I

CUMULATIVE TURNPIKE CONSTRUCTION IN NEW ENGLAND
AND MIDDLE ATLANTIC STATES, 1810-1830
(costs in thousands of dollars)

	1810		1820		1830	
	Mileage	Cost	Mileage	Cost	Mileage	Cost
Maine	35	$ 35	35	$ 35	35	$ 35
New Hampshire	455	455	527	527	527	527
Vermont	341	341	410	410	455	455
Massachusetts	767	1,851	843	1,966	964	2,086
Rhode Island	78	78	133	133	172	172
Connecticut	1,148	1,148	1,302	1,302	1,459	1,459
New York	1,100	2,000	4,000	8,000	4,500	9,000
New Jersey	200	600	500	1,000	550	1,100
Pennsylvania	500	1,500	1,800	6,400	2,500	8,800
Maryland	60	300	250	1,200	300	1,500
National Road	---	---	130	1,561	200	2,689
Total	4,684	8,308	9,930	22,534	11,662	27,823

Source: Lance Davis et al., American Economic Growth (New York: Harper and Row, 1972), p. 473.

and was immediately and immensely profitable. Transportation costs for shipping wheat from Buffalo to New York City fell from about $100 a ton to $10. Commerce crowded the Erie from its inception, and almost immediately plans were made for extensions and enlargements.

Other seaboard states imitated New York's efforts, the state of Pennsylvania being among the most enthusiastic. The state had invested heavily in road building before 1825, but the success of the Erie led to a decisive shift toward canals. By 1835 Pennsylvania had built 673 miles of canals and feeders to connect Philadelphia and Pittsburgh, and by 1842 about $33 million of state money had been sunk in such ventures. The Erie had been built through a natural gap in the Appalachians. But geography did not so smile on Pennsylvania, and the result was that both construction and operating costs were enormous. Other difficulties were that Pennsylvania tried to build everywhere at once, rather than building a trunkline as had New York. Finally, the cyclical downturn of the 1840s helped drag the whole project under, and in 1857 it was finally sold to the Pennsylvania Railroad for about twenty cents on the dollar.

The experiences of New York and Pennsylvania were replicated, with variations, by most other Eastern states. The state of Maryland, and the cities of Washington, D.C., and Georgetown all contributed to the C & O Canal. The B & O Railroad received aid from Maryland, Wheeling [West] Virginia, and Baltimore. Ultimately, Baltimore committed $13 million to transportation--the largest sum of any city.

Further South, Virginia too tried to bridge the Appalachians and stimulate local commerce via public construction of transportation projects, and by subsidizing or subscribing to the stock of private ventures. State expenditures for such projects totalled $55 million by 1861. South Carolina expended about $15 million on various roads, railroads, and canals before the Civil War, while in North Carolina, public aid amounted to about $10 million and was largely given to railroads.

Georgia had built a road as early as 1804, had improved rivers, and subsidized private railroads, but in 1834, the legislature resolved in favor of

> a scheme of internal improvements from the seaboard of this state to the interior by railroad on the faith and credit of the State as a great State work.

The glint in the Legislature's eye was the Western and Atlantic Railroad to be constructed from the Tennessee border to what is now Atlanta. A frankly developmental project, it was expected

to stimulate construction of private feeder lines which would "diffuse over all parts of the state almost a precise equality of advantages." Total state expenditures on railroad construction reached nearly $13 million by 1861, and accounted for 25%-33% of the state's entire budget during the 1830s and 1840s.[16]

Other eastern states did less. New Jersey and Delaware were able to rely largely on private enterprises, some of which were aided by the grant of valuable franchises. Maine and Massachusetts spent small sums in aid of private enterprise. Vermont and New Hampshire, by contrast, refused to be swept along, and in an early display of fiscal rectitude--not to say stubbornness--contributed nothing at all. At one point, New Hampshire even refused railroads the right of eminent domain.

In the West, wilder ventures were afloat. In an ambitious effort to link up with the Erie, Ohio began a state wide canal system in 1825, and by 1833 had completed 400 miles at a cost of $5 million. Thereafter, things got out of hand. Sectional logrolling led to the commencement of six new canals in 1836, and in 1837, state aid was forthcoming to twenty-six turnpikes, three railroads, and two more canals. By the time the system was finished, about 1845, it had cost some $16 million and included well over 700 miles of canals.

Indiana, Illinois, and Michigan were even more ambitious. After some tentative early advances, in 1836, the Indiana Legislature embraced public works with a passion. A "mammoth internal improvements" bill was passed which authorized borrowing of slightly less than $20 million for a variety of transportation projects. In a state so recently emerged from the primal mists, and with a population of only about 400,000, this was a considerable undertaking. To make matters worse, all projects were begun at once. As the legislature had neglected to place any tax revenues behind the improvements fund, interest was paid by new borrowing, an attractive technique which has often been replicated since. With tight money in 1839, this expediency dried up, and the state settled into bankruptcy midst reports of corruption and vast inefficiency. By 1841, about $9.5 million had been spent, yielding an annual revenue of some $31 thousand.

In Michigan and Illinois, as in Indiana, visions of instant development seem to have danced in the legislators' heads. Aside from the Illinois and Michigan canal, which was an immediate hit and in no small part responsible for Chicago's explosive growth, Illinois' other ventures came to a dismal denouement--a combined result of overborrowing, the undertaking

of too many projects, and the cyclical contraction beginning in 1839. In Michigan, this by now familiar story was largely replayed: immediately after statehood, an overly ambitious building program was begun. Plagued with mismanagement of a high order, corruption, and bankruptcy, it was finally abandoned in 1846.

In the South Central states, public transportation investments were generally quite modest, although Tennessee is an exception to this generalization, for there railroad aid from all levels of government totaled about $28 million. Louisville and other cities in Kentucky provided over $16 million of railroad aid, but the state itself provided almost nothing at all. Similarly, Mobile, Alabama and New Orleans, Louisiana were more important sources of public funds than their respective states, as each had a vital interest in inland commerce.

The period of massive aid to transportation on the part of the states came to a rather abrupt halt in the 1840s. The severe depression which began in 1839 and lasted until about 1845 was one reason. Several states which had become financially overextended were bankrupted, and a number of others came close. A revulsion against state involvement set in. But more basic forces were at work too. In the East and Middle West, the ability of private enterprise to mobilize capital and earn a profit in transportation was well-established by the 1840s. Increasingly therefore private businesses took up the banner of laissez faire. With the exit of most states from transportation investments, it seems likely that the ratio of public works to private construction began to decline sometime during the 1840s. As the data in Appendix II make clear, it did not begin to rise again until the last years of the century.

National and Local Projects, 1850-1873[17]

In the quarter century following 1850, government investments in transportation continued to be sizable. The tendency to aid private construction rather than to undertake the projects publicly, which was already identifiable in the early railroad projects, continued. However, the relative importance of the various levels of government changed markedly. The states, which had been the major source of funds up through the 1840s, declined in importance thereafter, and in the post-Civil War years, virtually retired from the field. Federal subsidies became enormous during these years, and aid from the cities was also considerable.

Beginning in 1850, Congress sharply increased the scale of its aid to private works of public utility, and it established the general location of projects to be subsidized. The Illinois Central and Mobile and Ohio were projects on which both North and South could agree, and both received large construction subsidies. In all, some 22 million acres of Federal land were given to private projects during this decade.

The greatest American public works of the nineteenth century were the transcontinental railroads. They were not, of course, publicly constructed or owned, but they were built with massive infusions of Federal aid.

Most early proposals for a railroad to span the continent advocated a purely public enterprise. The great Pacific Railroad surveys of the 1850s, which cost some $150,000, were public enterprises designed to find the best route west and to gather other scientific and practical information of broad public utility. The American Railroad Journal suggested that the railroad itself be built by the Corps of Engineers, and Senator Thomas Hart Benton of Missouri termed it a "national highway." But by the late 1850s, the tide was running against direct government economic activity, and while the surveys for the railroad were publicly funded, the advocates of public construction for the entire project were doomed to failure.

As matters turned out, construction of the Union Pacific and Central Pacific was by private enterprise with government subsidy. Under an act of 1862, the largesse consisted of land grants of ten sections per mile and first mortgage loans of between $16,000 and $48,000 per mile. The pot was sweetened in 1864 by doubling the land grants and reducing the public claim to a second mortgage. It worked. The Union Pacific was built at a cost of $59 million, about half of which was public in origin. The Central Pacific cost about the same amount to build, and once again, public funds accounted for about half the costs.

The scandals associated with building the two lines are well known, and surely two more rapacious groups than the Credit Mobilier which built the Union Pacific, and the Pacific Associates who constructed the Central Pacific, would be hard to find. For example, for constructing the Central Pacific the associates probably earned a 500%-600% return on their own investment! But this sort of result flowed almost inevitably from the desire to build the projects through private enterprise. Venture capital for such dubious and risky projects was simply not forthcoming in any great amount, and the result had to be an enormously leveraged company. This in turn meant

that when the project did finally pay off, it paid off in style.

Other transcontinentals were similarly subsidized by enormous Federal land grants. The Northern Pacific, the Atlantic and Pacific, the Texas and Pacific, and the Southern Pacific received large grants. All in all, Federal railroad subsidies amounted to about 129 million acres of land and loans of $65 million.

States continued to subsidize some private railroad construction after 1850. Under an act of 1854, Texas offered sixteen sections of land per mile to all railroad constructions, and by 1861 some five million acres of land had been applied for under this act. After the war, 27 million acres were given away, while other states provided financial aid in various forms totalling perhaps $95 million. Aid from localities after the Civil War vastly outpaced that from the states, and may have reached $175 million.

Significance of the Public Works to 1873

Rough estimates of the quantitative significance of public transportation investment are available. Up to 1860, total investment in canals amounted to some $190 million, of which the public component comprised some 73% or $139 millions. Annual estimates of public and private expenditures on canals by region from 1815-1860 are given in Table II below. Total railroad investment by that time was $1.145 billion of which some $280 million or 24% was public. Excluding roads, total public transportation investment, then, came to $420 million which equalled 31% of all investment in canals and railroads to 1860.[18]

The absolute amount of government aid to transportation after 1860 was also immense, and may have totalled $350 million, most of which occurred before 1873. But as a fraction of total transportation investment, it amounted to much less than in the antebellum decades. This declining significance of government involvement plus the fact that it came as aid rather than as public construction both highlight the fact that the early rationale for public involvement in transportation was eroding. As railroads grew to become giant enterprises dwarfing the states through which they ran, and as their access to capital markets improved, the building of them ceased to be a public work. Accordingly, after the middle 1870s government largely retired from the field of transportation investment until the twentieth century brought

TABLE II

INVESTMENT IN CANALS, BY REGION AND AGENCY OF ENTERPRISE
1815-1860
(figures are annual averages in millions of dollars)

	United States			North-east	South	West
	Total	State	Private			
1815-20	$ .5	$ .4	$ .1	$ .4	$ .1	$---
1821-25	2.5	1.8	.7	2.0	.5	---
1826-30	6.4	3.3	3.1	4.9	.5	1.0
1831-35	4.3	2.5	1.8	3.8	.1	.4
1836-40	10.6	6.7	3.9	5.8	1.3	3.5
1841-45	3.8	3.0	.8	2.4	.2	1.2
1846-50	3.9	1.5	2.4	3.0	.5	.4
1851-55	4.4	2.9	1.5	3.7	.4	.3
1856-60	2.7	2.0	.7	2.3	.3	.1

Source: U.S. Bureau of The Census, Historical Statistics of the U.S., Colonial Times to 1970, Bicentennial Edition (Washington, 1975), Series Q 559-564.

the Panama Canal and domestic highway construction on a large scale. And for about a century railroad construction became a private enterprise.

In assessing the significance of public investments in transportation and discovery up to 1873, three separate, but related, sorts of consequences need to be examined. These are (1) the implications which stem from the means of finance employed; (2) the significance of the fact that the investments were wholly or partly public, and (3) the impact of the investments themselves.

Means of Finance:--The ways in which states and localities financed and otherwise encouraged transportation investments were varied and occasionally exotic. Almost all canals were state constructed and operated, the finance having been arranged by bond sales. But it was in their encouragement of railroad construction that governments became truly imaginative. Although some railroads such as the Western and Atlantic in Georgia, and the Michigan Central were state constructed, most tended to be mixed or private enterprises which received various forms of state aid and encouragement.

Occasionally state aid simply took the form of a franchise privilege. Thus the Morris Canal in New Jersey and the Central railroad of Georgia both received bank charters from their respective states. During the period of "bank mania" this was a valuable franchise and reduced the companies' difficulties in raising funds. The Federal government and some states such as Texas provided aid in the form of massive land grants. But the dominant mode of participation was for the government to lend its credit to private enterprises. This took many forms. Often stock or bonds were purchased for cash (which had, itself, been raised by states' bond sales) or for the state's own bonds. Or, company bonds might simply be guaranteed by the state.

When states or localities lent their credit in any of these various forms they were, in essence, acting as financial intermediaries, or development banks offering to accept the paper of ultimate borrowers--railroads or canals--and raising the funds by issuing their own debt to ultimate lenders, some of whom were their own citizens, but most of whom were foreigners. The states were large, visible, and ongoing entities, and they had franchise and taxing powers; the result was that lenders saw their securities as less risky than those of small and unknown private enterprises and were willing to accept lower interest yields. Thus the use of public instead of private credit turned the state into a financial entrepreneur

providing the capital markets information and guarantees on projects too risky to be undertaken by unaided private enterprise.

Debt finance of public works had two important and interrelated consequences. It probably made them more procyclical than would otherwise have been the case, and it allowed them to attract foreign capital and so raised the total level of investment. Canal and railroad booms were part of a general bubble of optimism which characterized both the 1830s and 1850s. With construction dependent upon ease in the financial markets, the result was a rush to do everything at once--as after 1836--and a collapse when financial markets tightened--as after 1839. But boom and bust aside, debt finance allowed American public works access to world capital markets and surely raised the rate of investment. Foreign indebtedness rose from $85 million to $297 million between the 1820s and 1840, and one writer has estimated that 90% of all canal investment between 1835 and 1840 ultimately was financed by British capital.[19]

The assertion that debt finance made public transportation investments relatively procyclical is borne out by a comparison with the cyclical behavior of state geological surveys which were tax financed. Ordinary least squares equations show no significant association between appropriations on state surveys and an index of business cycle conditions for the years 1823-1878. However, when the data are partitioned into years when the cycle was above the trend, and years when it was below, a different picture emerges. When the cycle was below trend, it shows no association with survey appropriations. But for years above the trend, an equation of the following sort provides the best fit to the data:

$$\text{Ln (Appropriations)} = 5.52 + \underset{(8.16)}{1.46}\ \text{Ln (Number of States)} + \underset{(1.70)}{.16}\ \text{Ln (Index of Business Cycle)} + \underset{(4.37)}{.04}\ \text{(Time trend)}.$$

$R^2 = .88$

$F = 22$

What all of this seems to mean is that a ratchet effect existed for surveys which was absent in canal and railroad building. During flush times (years when business activity was above its long-run trend), state legislatures increased survey appropriation somewhat (their cyclical elasticity was only +.16). But during the downswing (years when business was below the long-run trend), levels were maintained--to be expanded again during the next expansion.

Less important than state debt finance in underwriting the transportation revolution were state and Federal land grants. The most important instance of land grant finance was, of course, the transcontinentals and it was not a good way to build a railroad.

What the railroads needed was cash, not land. Moreover, the land was reserved until each mile of construction was actually finished. Had the land been given "up front" it would have been hard enough to turn into cash, but the result of giving it after construction was to put a premium on quick and flimsy building techniques. Worse, grants were on a per mile basis and this resulted in both roundabout routes and in building where the land was valuable rather than where the transportation economics would have dictated. It is worth remarking that the Canadians learned from these errors. When the Canadian Pacific was chartered, the land grant was given prior to construction, and its location and size were also made independent of construction decisions.[20]

Public Nature of Investments:--That so much transportation investment was public had several significant consequences. As we have seen, public financing allowed lower cost access to world capital markets and therefore surely a higher level of transportation investment. In addition, both the interstate and intrastate distribution of investments was affected by their public nature. In the 1830s, it is hard to believe that unaided private enterprise would have generated much of any transportation investment in such frontier regions as Michigan, Illinois, and Indiana. Similarly, within states, legislative logrolling usually resulted in a broader geographic distribution of public works than private enterprise would have. Occasionally this resulted in uneconomic investments and wasted resources, as in Illinois, for example, where the urge to build everywhere at once led to disaster. But in other states, such as Ohio, political pressures to democratize the canal program successfully helped develop the more backward portions of the state.[21]

Impact of Investments on Economic Development:--The most significant consequences of the public transportation investments during the period 1820-1873 stemmed from their political and developmental consequences. Their most obvious political consequences resulted from the building of the transcontinentals which bound California to the Union, and from the bridging of the Appalachians, which bound the new Middle West to the older Atlantic Coast states with ties of kinship and economic advantage. The lower South, on the other hand, neither experienced the same transportation boom, nor found itself so tied to either North or West. Thus the

regional groupings which went to war in 1861 were shaped by the patterns of settlement and commodity flows which were themselves a result of the transportation revolution.

It was on the pace and pattern of economic development that public transportation investment had its greatest impact. Before the coming of canals and railroads, freight moved by wagon, at rates ranging from 30¢ to 70¢ per ton mile, and at the stately pace of around two miles per hour. The Erie and other canals resulted in a drastic decline in rates. By the 1850s, rates on the Erie were about one cent per ton mile; and similar rates also obtained in Ohio.

As transport costs fell, Ohio, Indiana, Illinois, and other Midwestern states experienced explosive population growth in the pre-Civil War years, as did the trans-Mississippi West during later decades. A flood of grain provided by highly mechanized, land-intensive techniques, and of other foods and raw materials resulted. Western farmers provided markets for Eastern manufactured goods, while Middle Western manufacturing for the local market was also stimulated. Cotton was the dominant export before the Civil War and hence paid for a large fraction of vitally needed imports. After the Civil War, Western expansion made America the granary of the Western world. Cheap food reduced pressures on urban living standards and also, by raising the fraction of workers' budgets devoted to non-food items, stimulated urban demands for manufactured items.

The expense of travel fell sharply for people as well as for goods during the transportation revolution, while speeds increased as did standards of comfort. In 1816, the traveler setting out from Philadelphia to Quebec was undertaking somewhat of an ordeal. The trip began by stage, over boneshaking roads, and continued via steamboat. For a total cost of $47, the passenger would arrive in Quebec 103 hours later. In 1860, the trip would have been made by railroad. By modern standards, antebellum trains were less than opulent. They occasionally caught fire and were subject to disastrous wrecks. But they were still a great improvement: the cost would have been $18.69, and the travel time would have fallen to about thirty-one hours--less than a third of what it had been.[22]

Urban Living

Antebellum urban growth was explosive. The total population of the United States rose by a factor of six from 1800 to 1860--from 5.2 million to 31.5 million people. People living in towns of 2500 or more grew from 322,000 to 6.2 million over the same period, or by a factor of 19! There were no American cities with 100,000 or more inhabitants in 1800, and only one was as large as 50,000. In 1860, both New York and Philadelphia had over a half million inhabitants, and a total of sixteen cities had at least 50,000 people.

Like public investments in the transportation revolution, municipal public works were also adjuncts to the dominant process of private economic development. Some, such as public education, were intended to create an atmosphere in which private activities might flourish, while others, such as municipal water works, were designed to cope with the rising social costs of private urban development. These and a host of other demands--for administration, housing, police and fire protection, urban transit, health and sanitation--stemmed from rapid urbanization. Initially however, most of these were ignored almost entirely, or they were handed over to private charity or private enterprise.[23]

A European traveler described the streets of antebellum American cities as follows: "American streets are wretchedly ill-paved and intolorably filthy, so badly lighted that it is dangerous to go out after dark . . . [with] chasms large enough to overturn an omnibus." He may have understated matters. Philadelphia had managed to pave 350 miles of streets with cobblestones by 1857, while New York had but 175 miles of paving. Goats, geese, chickens, sheep, pigs and rats rooted and wallowed in the streets which became filthy and impassable sloughs of mud in wet weather. In Chicago, of the 400 miles of city streets, about twelve were paved, and in Washington, where only Pennsylvania Avenue was paved, it is reported that a hog rooting in one street knocked a Senator off his feet.[24]

There were few public hospitals even in the large cities in 1860, because contemporaries did not view them as

institutions for healing the sick but rather as warehouses for the sick poor, and as practicing grounds for medical education. Massachusetts General Hospital was apparently one of the best, but it was private. Bellevue in New York was dilapidated and overcrowded. A news event of 1860 was that a newly born child there was devoured by rats.

Most other municipal services were also in their infancy. Beginning with the Boston City Library, erected during 1855-57 at a cost of $363,000, the tax supported free municipal library established itself. Urban transit was privately provided--by licensed omnibuses and later by franchised horsecar lines--which is to say it was priced beyond the reach of the urban working classes. Early water supplies were entirely private and most sewage disposal was left to the Almighty--who had thoughtfully provided rain, gravity, and buzzards.

Gradually, it began to dawn that many of these were public works and that a better job needed to be done. The two areas in which most progress was made was in building a mass public school system and in constructing municipal water works, and so we now focus on these significant forms of public investment.

Rise of Mass Public Education

Concern for public education antedated the American Revolution. So did concern over property taxes, and early school systems went to great lengths to avoid them. Lotteries were widely used to raise school funds during the early years of the nineteenth century, as were indirect taxes on "artificial curiosities, on traders in negroes, on the sale of runaway slaves, on billiard tables, on marriage licenses, and on liquors, innkeepers, hawkers, tenpin alleys, dogs, peddlers, and auctioneers."[25]

Such exotic means of finance were supplemented in a number of ways. Beginning with Connecticut in 1795, a number of states established permanent funds to supplement local educational resources. Federal aid had come even earlier. The ordinance of 1787 had set aside one section of every township for the maintenance of schools in that town. Beginning with Ohio in 1802, every subsequent state to enter the union except Texas, Maine, and West Virginia was to benefit from this early foray into educational revenue sharing. Additional Federal aid came in the form of the surplus revenue distribution of 1837, and many states used these funds for education.

On the whole, however, total public investments in educational plant and equipment were probably quite modest during the antebellum years. As Table III indicates, private funding outweighed public support until just before the Civil War. And while education accounted for about a fifth of total state and local spending in 1860, on a per capita basis or as a fraction of GNP, the sums were really extremely modest. Moreover, these figures include both current and capital expenditures; building construction itself probably averaged no more than a fifth of public educational expenditures during these years.

What the public got for its money was a rather rustic but effective system of primary education. New York's rural school buildings were described as "dilapidated," while Chicago used "ramshackle wooden structures" in which conditions were so crowded children were forced to stand.[26] Yet enrollment rates rose steadily and if few great profundities were imparted to the young scholars, apparently the ability to read was inculcated, for by 1840 90% of the population was at least literate. Foreign visitors commented on what a reading people Americans were. Anthony Trollope, after a visit to the United States, remarked in a somewhat surprised tone: "The fact comes home to one at every hour that the Americans are an educated people."

The motives in back of early educational expansion and the benefits which flowed from it are not fully understood. It is usually seen as part of the democratizing impulse which flowed from Jeffersonian and Jacksonian principles, and which shaped so much else in antebellum America. And its economic importance has usually seemed equally obvious: literacy makes workers more productive and enhances the ability of the population to invent and innovate.

This interpretation has recently been subjected to a rather systematic challenge.[27] For one thing, there seems to have been no statistical association between literacy and worker productivity in the early textile mills. And it was often not the workers themselves who clamored for mass public education, but rather the factory owners and educational reformers. Thus it seems that some of the impulse to educational reform came less from an urge to liberate the masses and enhance their skills, than from the desire to socialize them to the requirements of the early factory system.

The Springfield (Mass.) School Committee emphasized that schooling should inculcate "the habit of attention, self-reliance, habits of order and neatness, politeness and

TABLE III

EDUCATIONAL EXPENDITURES
1840-1860
(millions and percent)

National Totals

Year	Public Educational Expenditure	Total Educational Expenditure	Public to Total	Enrollment Rate	Total Expenditure to GNP	Public Educational Expenditure to State and Local Spending
1840	---	$9.2	---	38.4%	.6%	---
1850	$7.6	16.2	47%	50.4	.7	---
1860	19.9	34.7	57	56.5	.8	21%

Regional Breakdown

Region	Total Educational Expenditures			Enrollment Rates		
	1840	1850	1860	1840	1850	1860
New England	$2.7	$2.9	$4.4	81.4%	76.1%	73.8%
Middle Atlantic	3.4	5.6	9.9	54.7	61.9	61.3
South Atlantic	1.1	1.9	3.7	16.2	29.7	31.4
South Central	1.0	2.7	5.6	13.4	31.0	38.6
North Central	.9	2.6	10.0	29.1	52.4	69.4
Total or Average	9.2	16.2	34.7	38.4	50.4	57.0

Source: Albert Fishlow, "The American Common School School Revival: Fact or Fancy?" in Henry Rosovsky, ed., Industrialization in Two Systems (New York: John Wiley, 1966), pp. 40-67, and Fishlow, "Levels of Nineteenth-Century Investment in Education," Journal of Economic History, 26 (Dec., 1966), 418-436.

courtesy [and] . . . habits of punctuality."[28] And a writer in Massachusetts Teacher noted that

> the habit of prompt action in the performance of duty required of the boy, by the teacher at school, becomes in the man of business confirmed; thus system and order characterize the employment of the day laborer.[29]

But schools were to teach more than simply good work habits: they would also inculcate an acceptance of the factory system itself at a time when its future was not yet secure. George Boutwell, Secretary of the Massachusetts Board of Education, emphasized the importance of such teachings to employers:

> The owners of factories are more concerned than other classes and interests in the intelligence of their laborers. When the latter are well-educated and the former are disposed to deal justly, controversies and strikes can never occur, nor can the minds of the masses be prejudiced by demagogues and controlled by temporary and factious considerations.[30]

Growth of Public Water Systems

Municipal water supplies in colonial America were all but non-existent. A public well or two, of dubious purity, was the best that could be hoped for. By the 1790s, several of the Eastern seaboard cities began to try to improve their sources of supply. Their motives were complex: insufficient supplies as the cities expanded were an obvious spur, as was the great New York fire of 1776. So was disease. Yellow fever repeatedly visited Philadelphia, New York, Charlestown, and other cities during the 1790s, and many thought that the disease was associated with urban filth. One not entirely uncritical observer of Philadelphia in 1799 noted in the city of brotherly love

> a great variety of fetid and disgusting smells, which are exhaled from the dead carcuses of animals from stagnant waters, and from every species of filth.[31]

Cleanliness required pure water and lots of it, and was a prime mover in the demand for improved municipal water works.

Early attempts to expand water supplies were almost always left to private enterprises which were expressly chartered for the purpose. Attractively, they required no tax increases. Almost uniformly they failed. Capital shortages

resulted in inadequate service and that only to the wealthy neighborhoods. Visitations of plague and fire were discon-certingly egalitarian however. Moreover, rates were high as the private systems were too small to achieve all possible efficiencies.

With the well-demonstrated failure of private enterprise, Philadelphia installed the first municipal system in America. Begun in 1799, and using a steam engine to pump water from the Schuylkill River through log pipes, the system had cost $600,000 by 1815. And thereafter it was rapidly expanded as both population and per capita consumption soared. By 1840, the works served nearly 200,000 people and per capita consumption was at modern levels. Thereafter matters deteriorated. The system failed to expand to keep pace with population growth and industrialization began to pollute the Schuylkill and Delaware Rivers. Typhoid fever became a scourge, killing over 1,000 Philadelphians as late as 1906. Not until 1911 were filters and chlorine finally adopted.

Other large cities followed similar paths.[32] Repeated failures by private enterprise finally led New York City to build the great Croton Aqueduct. Begun in 1835 with a contemplated cost of $2.5 million, it was finally finished in 1842 and cost $11.5 million. Boston began the Cochuitate water works in 1846 and finished it in 1851 for an expenditure of about $5 million, while in Baltimore the municipal water works were not initiated until 1857. In Chicago, the city first began to tap Lake Michigan in 1851. By 1855, the system was too small, and by 1861 it was polluted. All in all by the eve of the Civil War there were sixty-eight public water systems in the country and many of these were grossly inadequate. In a number of cities, such as Providence, Rhode Island, Portland, Maine, Milwaukee, Wisconsin, and Washington, D.C. there were no provisions for public water supplies. Moreover, no city in the country had a complete sewer system. Not until the 1880s did increasing industrialization and urbanization, and increasingly deadly outbreaks of typhoid, cholera, and other mass killers finally induce widespread public investments to bring anything like pure water and adequate sewage to even a fraction of the urban population.

CHAPTER II

RISE OF THE CITIES: 1874-1932

There are several reasons for thinking that the 1870s mark a great divide in the history of public works. First, it seems likely that the relative importance of local public works rose sharply, while the role of the Federal government dwindled. Second, the composition of public works changed drastically. Public transportation investments declined until the early twentieth century, and in general public works tended to accommodate private urban development, but with a lag. And to a considerable extent, these accommodating public works were designed to clean up the rising social costs of private enterprise. Third, thinking about public works evolved into its modern form during these years. With the advent of large private organizations capable of mobilizing capital, the activities which it was thought acceptable for governments to undertake became increasingly confined to areas where private enterprise could not earn a profit. Thus the secular decline in the ratio of public works to total construction which probably began when the states got out of the transportation revolution in the 1840s, continued to the end of the century. Thereafter, pressing municipal needs began public construction on its long-term twentieth-century rise (see Appendix, Tables I and II).

The Eclipse of Federal Public Works

It is customary to describe Munn vs. Illinois (1877) as a landmark in the history of government intervention in the economy. In Munn, the Supreme Court affirmed the power of the state to regulate business "affected with a public interest."[33] Yet Mark Twain called the 1870s the "Gilded Age"--the classic era of laissez faire.

Clearly, it was an age in transition. But however important Munn may have been in principle, Federal public works dwindled in magnitude and in their importance to the economy during these years. With the transportation revolution now firmly in private hands for a time, Federal activities during the years between 1874 and 1932 consisted largely of river and harbor construction, lighthouse building, reclamation, the building of "military" roads through the territories, and some other minor items.

Tables IV and V below present some of the relevant data on Federal public works during this period. As can be

TABLE IV

FEDERAL CONSTRUCTION
1869-1928
Data are Annual Averages for Decades
(millions and percent)

Year	Federal Construction[a]	River and Harbor to Federal Total Construction	Federal Construction to Federal Spending	Federal Construction to GNP
1869-78	$11	45%	4.0%	.15%
1879-88	12	73	4.6	.11
1889-98	23.5	64	6.7	.17
1899-08	49.2	43	8.7	.28
1909-18	65	56	3.2	.19
1919-28	120	46	3.3	.10

Source: These data are calculated from the Appendix tables II, V, VI, and VII. For Decades 1869-78 - 1909-18 Federal construction computed by applying Kuznets' estimates of Federal shares to government construction. For 1919-28 data exclude Federal grants to states and municipalities and begin in 1920 to exclude the effects of World War I.

[a]Excludes military construction.

TABLE V

FEDERAL NON-MILITARY CAPITAL ASSETS
CONTINENTAL UNITED STATES,
1902-1932
(millions of dollars)

	Real Property in D.C.	Buildings Outside D.C.	Rivers and Harbors	Reclamation	Other	Total
1902	$ 233	$126	$ 259	----	----	$ 615
1912	266	231	401	$ 73	$11	982
1922	310	303	637	134	2392	3775
1932	333	527	1133	191	435	2619

Source: Solomon Fabricant, "Government-Owned Nonmilitary Capital Assets since 1900" in Studies in Income and Wealth, vol. 12 (New York: National Bureau of Economic Research, 1950), pp. 527-547. See table 2.

seen, capital formation ranged around three to four percent of Federal spending during most of the entire era, and remained a miniscule fraction of GNP. Although a detailed breakdown of the project composition of Federal public works does not exist, enough information is available to allow an impressionistic portrait of the era. Both of the above Tables indicate that river and harbor work must have dominated Federal construction until the 1930s. This is borne out by the annual construction estimates which indicate that such projects accounted for 40% to 60% of Federal building, while the data on the project composition of the Federal capital stock, contained in Table V, tell a similar story.

Although it is pretty clear that Federal public works dwindled to virtual insignificance during this era, two aspects of Federal construction are worth comment. The turn of the century saw the beginnings of Federal reclamation work in the trans-Mississippi West. And at about the same time, the decision was taken to build the most spectacular public work since the Pyramids--the Panama Canal. Private enterprise had repeatedly tried and failed to construct such a project, the most celebrated fiasco being that of De Lesseps' French company during the 1880s. Private enterprise had managed to construct the first "transcontinental railroad" across the isthmus, however--a one-track, forty-seven and a half mile long operation which, when finally finished in 1855, had taken five years to build and cost eight million dollars, and which proved to be a gold mine to its owners.[34]

The failure of De Lesseps' and other lesser private ventures made it clear that this would have to be a publicly built public work, and after seemingly innumerable delays, the dirt finally began to move in 1904. Everything about the project was larger than life. The final cost of some $352 million was larger than total Federal expenditures had been as late as 1896. Measured another way, the cost was equally staggering: 6000 people died during the American regime and the total cost in human life under both French and Americans may have been as high as 25,000 people. Over 262 million cubic yards of earth were excavated. The Gatum locks were 1000 feet long and over six stories high. And they had taken over two million cubic feet of concrete to build. During the process of construction yellow fever had been conquered. A new country--Panama--had been created.

Like the canal itself, its benefits were immense. It sharply reduced the costs of shipping the world's goods, and more than any other single event, it created a two-ocean American Navy. By the 1920s traffic exceeded 7000 ships per year, and by the late 1940s, it had doubled. By the 1970s

15,000 ships and 100 million tons a year were sent through it. Although tolls had remained unchanged since 1915, revenues exceeded $100 million.

At about the same time the canal was being dug, the Federal government initiated a new species of public work. It entered the irrigation business. Federal efforts to promote land reclamation in the states beyond the 100th meridian date from the nineteenth century. In various ways it had tried to stimulate private and state irrigation projects, but none of these had been notably successful. The Reclamation Act of 1902 represented a sharp departure from these efforts. The Act set up a Federal Reclamation Fund to finance Western irrigation projects which were to be built by the newly created Bureau of Reclamation. Although financed from a reclamation fund raised from public land sales, the capital charges of these reclamation projects were ultimately to be amortized--without interest--by payments from the water users themselves.

The Bureau began work almost immediately, undertaking four projects in 1903 and another six during 1904. Over the years, flood control and electricity generation became project goals and the Bureau evolved into a multiple purpose water development agency. By the early 1930s, it had undertaken thirty-five projects which provided water to over 42,000 farms. Crops produced on Federally reclaimed land from 1906-1931 had a cumulative value of $1.2 billion. Construction costs from 1915-1951 are shown in Table VI below.

In spite of such seemingly impressive results, most outside observers have been highly critical of Bureau activities. The Act itself was designed to subsidize agriculture--an activity which runs at cross purposes with other policies designed to restrict farm production--and even so, water users were unable to amortize the projects. By the early 1930s none of them had returned its original cost of construction.[35] But if critics have not been kind to the Bureau, Congress has been; we shall return to the Bureau's activities during the 1930s when it undertook some of its most spectacular projects.

Growth of State and Municipal Public Works, 1870 on

It is apparent that public works as a fraction of total construction and of GNP began to rise some time during the late nineteenth century. And it is equally apparent that the sources of growth resided at the state and especially the municipal level. Data in Appendix Table VI reveal the rising

TABLE VI

BUREAU OF RECLAMATION CONSTRUCTION
1915-1951
(millions of dollars)

Year	Construction	Year	Construction
1915	$7	1935	$47
6	6	1936	56
7	6	7	60
8	6	8	67
9	5	9	72
1920	5	1940	74
1	7	1	79
2	9	2	60
3	9	3	42
4	8	4	36
1925	7	1945	39
6	6	6	60
7	6	7	125
8	7	8	175
9	8	9	223
1930	11	1950	255
1	20	1951	207
2	26		
3	26		
4	35		

Source: U.S. Department of Labor, Bureau of Labor Statistics New Construction Expenditures 1915-1951 (NP, ND).

share of state and local public works in total public construction. Almost certainly it was the cities which accounted for this increase. Table VII below provides further information on state and local capital formation. Apparently about a fifth of total state and local spending was devoted to capital items from 1870 on, and state and local capital formation rose from less than one percent to well over two percent of GNP by the 1920s.

A detailed breakdown of the project composition of state and municipal capital formation is unavailable until the twentieth century. However, the data in Table VIIa below do provide information on the composition of municipal governments' capital assets for several years. Together with impressionistic evidence, they can at least identify what must have been the major kinds of investments. These were education, sewer and waterworks, streets and roads, plus several other minor areas. We survey the accomplishments in these areas below.

Education up through World War I

Data exist on educational expenditures for census years and there are annual estimates of capital formation in education from 1889 on. Some of this information is contained in Table VIII below. Public expenditures on education remained stable as a fraction of GNP from 1870-1880, and thereafter rose steadily but modestly to 1910 and then stabilized again to 1920. Moreover, expenditures per pupil rose throughout the entire period, as did capital expenditures per student from 1890 on. From the 1880s through World War I, about a quarter of all state and local expenditures went for education, and by 1922 education accounted for 30% of their budgets.

Yet if the picture which seems to emerge is one of a society in which an increasing fraction of its resources and especially its public budget is devoted to education, that is by no means the entire story. In fact, the history of education from 1870 up until 1910 or so is a history of too little and too late. The decades after 1870 were a period of enormous immigration and population growth. And for the first time, the black population was free and eligible for school enrollment. Though the schools expanded rapidly during these years, they failed to keep pace with the burgeoning school age population. Enrollment rates which had risen steadily until they reached 58% of the school age population by 1880, then declined to 50% in 1900 and stood at 59% in 1910.

TABLE VII

STATE AND MUNICIPAL CONSTRUCTION, VARIOUS YEARS
1870-1932
(millions and percent)

Year	State and Municipal Construction	State and Municipal Construction to: State and Municipal Spending	State and Municipal Construction to: GNP
1870	$49.4	17.6%	.7%
1880	69.6	22.2	.7
1890	99.8	17.6	.8
1902	164	14.9	.8
1913	442	19.6	.1
1922	1,584.0	28.0	2.1
1932	1,529.0	18.1	2.6

Source: Column one, 1870-1890 computed by applying Kuznets' estimates of State and Municipal shares to government construction. Appendix tables II and VII. For 1902 and 1913 data are from Historical Statistics of the United States Colonial Times to 1970 (Washington: G.P.O., 1975), Series Y-673. For 1922 and 1932 data are from Appendix table VI and include Federal grants in aid

TABLE VIIa

MUNICIPAL GOVERNMENT CAPITAL ASSETS
SELECTED YEARS
1902-1930
(millions and percent)

	Cities over 25,000		Cities over 30,000
	1902	1912	1930
Distribution Excluding Streets, Sewers and Schools (in percent)			
General Control	7.1%	6.2%	5.9%
Police	1.4	1.1	1.0
Fire	3.7	3.6	2.9
Other Protection		.7	.7
Health			.9
Sanitation			3.8
Charities	1.9		
Hospitals	.8	4.2	4.2
Correction	1.4		
Recreation	38.7	33.7	31.7
Highways			1.3
Miscellaneous	3.6	5.3	4.7
Water Systems	26.9	33.8	29.8
Electric Light	.6	.9	2.7
Other Public Service	14.0	10.4	10.5
Total in Millions	$1,397	$2,730	$8,219
Other Assets in Millions			
Schools	$602	$1,266	$6,211
Streets and Bridges	883	1.700	---
Sewers	455	---	---

Source: Solomon Fabricant, The Trend of Government Activity in the United States Since 1900 (New York: N.B.E.R., 1952), table C-7 and Fabricant, "Government Owned Nonmilitary Capital Assets Since 1900," Studies in Income and Wealth, vol. 12 (New York: N.B.E.R., 1950), tables 5 and 6.

TABLE VIII

STATE AND MUNICIPAL EXPENDITURES ON
PRIMARY AND SECONDARY EDUCATION
1870-1920
(dollars and Percent)

	1870	1880	1890	1900	1910	1920
Total Expenditures in Millions	$61.7	81.5	147.4	229.4	577*	1705**
Capital Expenditures in Millions	---	---	$26.0	49.0	70.0	154.0
Capital to Total	---	---	17.7%	17.5	16.4	14.9
Total Expenditure per Pupil	$8.98	8.26	11.58	14.77	23.90	48.00
Capital Expenditure per Pupil	---	---	$2.04	2.58	3.93	7.14
Total Expenditure to State and Local Spending	22%	26	26	25	26*	30**
Total Expenditure to GNP	.84%	.84	1.2	1.3	1.4	1.4
Enrollment Rate	48.4%	57.8	54.3	50.5	59.2	64.3

Source: Rows one and six from Fishlow, "Levels," as cited in Table III above, to 1900. For 1910 and 1920 see Historical Statistics, Series H420, H499, Y684.

*For 1913
**For 1922

Enrollment rates for black Americans parallel those for the entire population. From 1870-1880, rates rose from less than 10% of the school age population to about 33%. They then declined to 31% in 1900 and thereafter again began their upward climb, reaching 45% by 1910. The Progressive Educational movement during the early twentieth century is clearly a lagged response to the increasing inability of the schools to meet the needs of the larger society during the late 1800s. Immigration had greatly expanded the labor force, but many immigrants were illiterate and few were socialized to the work habits required by the industrial system.[36] After 1900 the educational system expanded to fulfill these needs and expenditures per pupil rose even as enrollment rates increased sharply. Similarly, capital expenditures per student rose--slowly--up to 1910. Thereafter they stagnated until a great boom in educational construction began during the 1920s.

Water Supplies and Sewerage Systems

In the half-century after the Civil War, America became an urban society. In 1870, a quarter of the population resided in urban places--an urban place being modestly defined to include towns of 2500 or more--and there were as yet no cities with a million inhabitants. By 1920, there were three cities with over one million residents each, and one-third of the population lived in cities of 50,000 or more. For the first time, over half the population lived in urban places.

Urbanization resulted in unprecedented demands for expanded and purer water systems. Older cities were forced to extend and expand already existing systems while smaller and newer cities made their first public investments in water supply systems during this period. In both cases, two forces impelled the expansion. One was simply the need for more water and the other, with which it occasionally conflicted, was the need for purer water.

Chicago's public water supply system antedated the Civil War, but explosive population growth during the Gilded Age led to repeated expansions in the system. In 1867, the city built a two mile tunnel into Lake Michigan at a cost of $465,000. Less than a decade later a second tunnel and pumping station were built, and a third followed in 1887. Similarly, New York City was forced to expand the Croton Aqueduct in the decade after 1883, and the Catskill water supply system was begun in 1907. With local variations, every other city in the country replicated these experiences.[37]

These expansions in municipal water supply systems occurred before the role of water-borne disease was fully understood. Hence, early systems, when they became polluted, spread disease much more rapidly than had the older system of independent and private wells. It is likely therefore that early water supply systems actually raised urban death rates from water-borne diseases.

Gradually a public health movement arose in Britain and America. Disease is remarkably democratic and the support for public health stemmed less from any concern with the poor than from a concern with epidemic. In an often told incident, the Broad Street pump in London was found to be the source of 500 cholera fatalities within a 250 yard radius. American cities during the 1880s and 1890s regularly experienced death rates from typhoid fever of between sixty and seventy per 100,000. During epidemic periods, death rates reached 160 per 100,000 in Lowell, Massachusetts in 1890, and 173 in Chicago the following year.

Such slaughter, as it became increasingly linked to polluted water, led cities to look for purer supplies or to find ways of purifying existing sources. Newark, New Jersey finally abandoned the polluted Passaic River as a water source in 1892, while Patterson finally got around to filtering it a decade later. Likewise, Lowell, Massachusetts gave up on the Merrimac River, while Lawrence installed a filtration system. In 1904, Cleveland extended its tunnel further into Lake Erie in a search for purer water, while Philadelphia finally completed a filtration system in 1911. Chicago's solution was the most imaginative: in 1900, at a cost of $40 million, it reversed the flow of the Chicago River from Lake Michigan to the Mississippi River, thereby exporting its sewage downstream.[38]

Yet the progress toward pure water was extraordinarily slow, as Table IX indicates. By 1910, only a fourth of the urban population had filtered water and the absolute numbers of people involved were less than the entire urban population had been thirty years earlier in 1880. Not only did public investments lag behind the exploding urban population, they would have been insufficient even without such growth!

A major reason for the deterioration of urban water quality after the Civil War was that American cities were almost completely lacking in sanitary sewers until the 1880s, and systems for the removal of surface refuse were not much more advanced. As a consequence, most urban areas were reputed neither for their spotless decor nor their pleasing aroma.

TABLE IX

URBAN WATER FILTRATION SYSTEMS, 1880-1910

Year	Urban Population (millions)	Population with Water Filtration (thousands)	Percent of Population with Water Filtration
1880	13.3	30	.23 %
1890	21.4	310	1.45
1900	29.5	1,860	6.30
1910	42.0	10,805	25.70

Source: Edward Meeker, "The Social Rate of Return on Investment in Public Health," Journal of Economic History 34 (June, 1974), 392-419. See table 5.

As a citizens' association survey described New York City in 1865:

> Domestic garbage and filth of every kind is thrown into the streets, covering their surface, filling the gutters, obstructing the sewer culverts, and sending forth perennial emanations which must generate pestiferous disease. In winter the filth and garbage, etc., accumulate in the streets to the depth sometimes of two or three feet.[39]

Holyoke, Massachusetts, a decade later, was no better:

> In many cases, there is no provision for carrying the slops from the sinks, but they are allowed to run wherever they can make their way. Portions of yards are covered with filth and green slime, and within twenty feet, people are living in basements three feet below the level of the yard.[40]

Beginning in the 1880s, American cities began to construct sewers, and by 1910, most had some sort of system.

Data on capital formation in sewer and water systems are exceedingly sparse. Such estimates as can be derived are presented in Table X below, and even allowing for a wide margin of error it seems clear that public sanitation investments probably accounted for a small fraction of total state and local expenditures. Their benefits, however, seem to have been enormous. Between 1880 and 1910, life expectancy at birth for male children rose by eleven years and for female children by fourteen years. Economic gains from public health investments include the additional output associated with longer working lives plus the reduction in lost time for sickness. An additional important if immeasurable gain was the reduction in pain and suffering from illness. The first two benefits can be monetized, approximately, and allow the computation of a social rate of return to public health investments. A minimum estimate is that yields ranged between 6% and 16%. As earnings on other forms of capital averaged between 4%-5%, it is apparent that public health investments were not only economically viable, they were--as the qualitative evidence also suggests--too little and too late.[41]

Urban Transportation Systems to 1930

Colonial cities had been walking cities. Explosive growth of population, commerce and manufacturing in the antebellum years raised downtown land values, resulted in

TABLE X

MUNICIPAL EXPENDITURES ON SEWERS AND ON WATER FILTRATION SYSTEMS, 1881-1910
Figures are Annual Averages
(millions of 1929 dollars)

Year	Sewer Construction 1929 Dollars	Water Filters 1929 Dollars	Real Sewer and Water as Percent of State and Local Construction[a]
1881-85	$13.12	$.08	7.6%
1886-90	17.80	.11	8.3%
1891-95	9.30	.47	3.6%
1896-00	11.30	.60	3.5%
1901	14.20	1.65	3.1%
1906-10	17.40	4.16	2.8%

Source: Columns one and two from Edward Meeker as cited in note twelve above.

[a]State and Local Construction estimated by applying Kuznets' estimates for state and local shares (see below, Appendix table VII) to government construction (Appendix table II).

unimaginable crowding in working-class neighborhoods, and led the bourgeoisie to begin to move to the edges of town. Thus was born the demand for urban mass transit. The result was, initially, the omnibus--a blend of the stage coach and hackney --followed by the horsecar and later the steam driven elevated railway, in the 1870s.[42]

All of these early efforts at mass transportation were franchised private companies, and because of high fares, none provided truly mass transportation to the urban working classes. Surface transportation continued to remain the almost exclusive province of private enterprise during this period; as late as 1925, only fifteen cities in the United States owned their trolley lines, and many of these had been purchased from private companies. Subways, however, were a different matter. There the capital costs were so staggering that private enterprise drew back and so subways became a public work.

The first subway system in the United States began in Boston, in 1894. By 1907, a little less than eight miles had been opened at a cost of $15 million. In New York City, years of wrangling preceded the final decision to build a publicly constructed system. Banker Jacob Schiff thought subways enormously capital intensive and unlikely to be profitable. Accordingly he favored public ownership. Another consideration was corruption. The old franchised transportation monopolies had been notable for their persuasiveness with municipal aldermen. Public ownership, though perhaps unprofitable, would at least reduce this drain upon the city's purse, or so it was thought. The system was finally begun in 1901 and partially completed by 1914, at a cost of $30 million. Extensive expansion followed rapidly and continuously up through 1917. Funding came from the city and from the private companies which operated the system, and by 1918 $400 million had been spent, half of it public funds, and the entire system included 620 miles of trackage. Clearly this was a stupendous undertaking, and it stood virtually alone. Except Boston, no other city undertook significant public transportation investments during this period.[43]

Improving the Cities' Streets and Other Items

Expenditures on streets and bridges accounted for major portions of most cities' public works investments from the 1870s on. It will be recalled that as late as the Civil War, paved streets--even in large cities--were a rarity. This began to change rapidly in the 1870s, although as late as 1897, a survey of 144 cities of over 10,000 population revealed that

twenty-two of them still had no paved streets at all! Still, expenditures for paving, widening, and extending city streets came to be the largest single capital expenditure in most cities' budgets. For example, detailed census data on cities' payments for "the acquisition or construction of the more or less permanent properties and public improvements," reveal that in 1909 payments for roads and streets constituted about 32% of all such expenditures. By contrast, the next largest single item--water works--accounted for 20%, schools 13% and sewage disposal 10%.[44]

Bridge construction, though a much smaller item than expenditures on streets, resulted in much more spectacular final products. Saint Louis bridged the Mississippi in 1870 at a cost of $10 million, and Boston repeatedly expanded and improved its bridges throughout the nineteenth and early twentieth centuries. But New York's Brooklyn Bridge was the most spectacular of such undertakings, and surely constitutes the greatest municipal public work of the nineteenth century. Built by a mixed public and private company, it was finally completed in 1883 after thirteen years of construction. It spanned 1595 feet, six inches, cost about $15 million, and it put Brooklyn on the map.[45]

Although streets and bridges, schools and sewers were the major items of municipal investment in the years after 1870, cities also engaged in an enormous variety of other public works, some of which may be briefly indicated here.[46]

The first municipally owned electrical generating station was built in 1881. As the number of private plants grew and as their reputation for charging monopoly prices and buying local aldermen grew with them, the municipal ownership movement arose. By the 1920s, there were some 2500 municipally owned plants. Although this amounted to about one-third of all electrical plants, the municipal works tended to be located in the smaller cities and were much smaller than private plants. For similar reasons, some cities began to build and operate their own gas works, but by 1923, only 109 out of 1774 gas works were city owned.

For port cities, public investments in wharfage and piers became increasingly common as there was a gradual shift away from private ownership. For a few cities, during a few years, these investments constituted a substantial fraction of their public works budgets. All cities undertook the usual expenditures on city halls, court houses, and police and fire stations, and on hospitals, asylums, libraries and museums, but census data on cities' financial statistics suggest that in no case did any of these constitute an important fraction of public works expenditures.

Some cities also built ice plants, and asphalt plants were publicly owned in nearly 100 municipalities by the 1920s. St. Paul, Minnesota, owned its own bank, while slaughter houses, printing plants, baths, ferries, markets, laundries, parks and recreational facilities, heating plants, coal yards, milk pasteurization works, and bathrooms were publicly built and owned in various cities at various times. Though at no time during this period did the funds committed to these projects constitute an important fraction of municipal public works, they are impressive testimony to the range of projects which, at one time or another, Americans have thought to be public works.

The Construction Boom of the 1920s

The decade of the 1920s marks a partial reversal of some nineteenth- and early twentieth-century trends in public works spending. The relative share of public building in total construction continued to rise, and the Federal role remained insignificant. But the historic concern with transportation was reasserted, and the importance of the states--which must have declined from the 1840s on--now rose sharply. Both of these changes were attributes of the great road building boom that engulfed the 1920s.

Most economic histories of the 1920s emphasize the great boom in private investment which occurred. In real terms, private construction rose 127% from 1920 to its peak in 1926; thereafter it slid 12% to 1929, and then collapsed utterly. But non-military and non-residential public works construction, paced by road and school building, also rose sharply, and much more continuously, during these years. Real public construction rose 140% from 1920-1926, outpacing the private building boom. And public works investments continued to rise after 1926, peaking only in 1931 at 3.5 times their 1920 level. The increase in public construction from 1926-1931 offset about 15% of the decline in private building during the same period, thereby moderating the severity of the great contraction from 1929 through 1931.

Public construction during the 1920s was dominated by road building and, to a lesser extent, school construction. As we have seen, road construction is a public work which dates to colonial times and in which all levels of government have engaged. The half century after 1850 saw some 1.5 million miles of rural roads built. Most were dirt. A 1904 survey showed a total of 2.2 million miles of rural road, of which a little over 153,000 had some form of paving. Borrowing to finance construction was rare; most roads were paid for from

property taxes and the requirement that local males spend a certain number of days a year on road work. Gradually, pressured by the bicycle boom of the 1880s and 1890s, states began to act in this area, subsidizing local construction, allowing the use of the property tax for road finance, and imposing a state system on the localities. Still, by 1905, only fourteen states had highway departments, and state spending constituted only 3% of total road construction costs.[47]

It was, of course, the coming of the automobile in the first two decades of this century which put enormous pressures to improve the nation's road system. In 1912 there were less than one million cars registered in the United States. By 1930, there were twenty-six million. The growth in automobile usage resulted in pressures on all levels of government to improve and expand the road network. Major Federal involvement in road construction dates from the Highway Act of 1916. As amended in 1921, this act provided matching funds for state road construction of primary and secondary roads up to seven percent of a state's total mileage, and by 1919 it had induced every state in the union to create a bureau of public roads.

Expenditures on road construction are contained in Appendix Table IV and the story they tell is clear enough. From 1920 to their cyclical peak in 1931, real road construction expenditures rose 277%, and throughout the 1920s road building amounted to about 37% to 38% of all public construction. The result was that total surfaced mileage of roads more than doubled between 1920 and 1931, rising from 369,000 to 830,000 miles over the period. Financing was largely from the states' and localities' own resources and most of this came from various user taxes. Federal aid amounted to no more than 18% of states' highway revenues during this period, and its significance dwindled as the decade progressed, while borrowed funds fluctuated between 10% and 20% of total receipts over the same period. User taxes, by contrast, amounted to about a third of all revenue in the early 1920s and were over 60% of total receipts by 1929.

The road building boom of the 1920s is a clear exception to the earlier generalization that public works evolved from leading to lagging during this period. Annual automobile sales rose from less than one million in 1915 to over 4.4 million in 1929--a peak which was not again reached until the 1950s. It is hard to imagine such a surge in sales, had not automobile usage been underwritten by a massive and nearly simultaneous expansion of the network of surfaced roads.

Together, automobile sales and road construction furthered the trend toward suburbanization which the railroads had begun. Automobile production itself accounted for 12.7% of all manufacturing output in 1929, and the industry absorbed 20% of all steel output, 90% of petroleum production, 80% of all rubber, three-fourths of plate glass, and was the largest single user of machine tools. Clearly the automobile-road complex was the dynamic element in the economy of the 1920s and its impact compares favorably with that of the railroads in the 1870s and 1880s.[48]

Although less dramatic than the expansion in road construction, school building also boomed during the 1920s. From 1920 to its peak in 1930 capital formation in schools rose 170%. Combined, road and school construction accounted for well over half of all public works during the 1920s.

More than any other factor, demographic trends were responsible for the educational building boom. The school age population (children aged 5-19) rose by 3.4 million from 1910-1920, but it grew by 4.8 million from 1920-1930--a 41% increase. Moreover the college age population (individuals aged 20-24 years) had risen by only 200,000 from 1910-1920, and then increased by 1.2 million individuals during the next decade. Meanwhile, school enrollment rates for both groups rose sharply. The none too surprising result was an upswing in educational capital formation.

Before we leave the 1920s, several other characteristics of public works during this period should be briefly noted. First of all, construction other than roads and schools also rose sharply during this period. Expenditures for hospitals and other public buildings doubled during the 1920s, while funds committed to sewer and water works tripled. Second, while highway construction was largely tax financed, a substantial fraction of total state and local construction was debt financed during the 1920s. For example, during 1927 state and local governments issued debt equal to about 46% of their new construction during that year (see Appendix Table VIII). Debt to income ratios for state and local governments remained well over two--a level they have not attained since World War II. Finally, the role of the Federal government in public works hit its lowest point since the Civil War. In 1927 direct Federal construction plus grants in aid totaled less than eight percent of total public construction.

Several significant conclusions emerge from the above analysis of public construction during the 1920s. Clearly debt financed public works helped propel the boom to 1926 and

thereafter offset some of the depressing influence of falling private construction. Had public works paralleled the behavior of private building we might well remember the Great Depression as having begun in 1926. Thus the gradual growth in the fraction of all investment which is public both antedates the New Deal and finds its origin in state and local rather than in Federal construction. Second, the most important public work investment was road building. With the rise of the automobile, investments in transportation infrastructure returned to the category of public works--after some 50 years as a private activity during the height of the railroad era--and thereby helped stabilize economic activity. Thus technological change in transportation, by shaping the balance between public and private works, eroded some of the instability which characterized nineteenth-century capitalism.

CHAPTER III

EMERGENCE OF THE FEDERAL GOVERNMENT 1933-

For most economic historians, the Great Depression and the New Deal are a watershed. This is also true in the history of public works, for four major reasons.

1. The expansion of the public sector meant that it exerted a more significant impact on the course of economic activity than in any period since the 1840s.

2. For the first time, the Federal role in public works became paramount.

3. The kinds of investments considered to be public works were broader than during any previous period.

4. New justifications for public works were advanced. They included for the first time Federal acceptance of the obligation to relieve mass unemployment. In addition certain public works were to provide a "yardstick" by which to measure the performance of private enterprise. Finally, public construction was to "prime the pump"--a demand oriented version of the old notion that public construction would "release private energies."

New Deal Public Works

On March 4, 1933, when Franklin Roosevelt took office, the United States had experienced three and a half years of unprecedented economic contraction. Unemployment had risen to a quarter of the labor force, and money income had fallen in half from its 1929 level.

As is well known, neither Roosevelt nor most of the early New Dealers had any clear idea of the economic theory of fiscal policy, only then being worked out by J. M. Keynes and his Cambridge colleagues. What the New Dealers had was a somewhat more straightforward--if slightly mistaken--notion that if you hired someone who was out of work then that was one less person without a job. This was not entirely a novel idea, and professional economists had long made a modest living by denouncing it as logically incorrect and fiscally unsound. But for men of action and the unemployed themselves, public works to create jobs had anciently been a temptation. New York state had shipped the unemployed to work on the Erie Canal in

1855, and most of the major nineteenth-century contractions had seen demands by the unemployed for public works. During the long depression of the 1870s a number of cities used public construction to provide relief, and others had done so during 1914-1915. At the Federal level, there had been serious proposals in 1920 and again in 1923 to use public works as a countercyclical device.[49]

In spite of such precedents, the mid-1930s do represent a sharp departure from past practice. For the first time countercyclical public works achieved both academic respectability and the support of at least some powerful political and economic interests. Grudgingly under President Hoover, the Federal government began to use public works to relieve mass unemployment, and new administration in 1933 sharply increased these investments in compassion.

States and localities had been the major sources of public construction during the 1920s, but after 1931, faced with declining tax revenues and collapsing bond markets, they cut back sharply on their capital expenditures. In short, they behaved in modified form like private enterprises. As a result, when Federal construction expanded, it came to account for some 60% to 65% of all public construction from 1933-1938, and equalled nearly a third of total construction. Never before had public construction been so dominant, and never before had the Federal presence loomed so large.

As might be expected, the administration of Federal public works funds was complex.

> In the first place, there is ordinary Federal construction undertaken as in the past by numerous departments and agencies and financed from regular appropriations. Second, there is direct construction by Federal agencies and departments financed by Public Works Administration funds. In the third place there are Public Works Administration grants for non-Federal construction of various types, and regular Federal grants to states and localities for highway construction. Fourthly, there are work relief expenditures under the works program, primarily under the jurisdiction of the Works Progress Administration. Finally, the Public Works Administration, Reconstruction Finance Corporation, and United States Housing Authority have made loans to both public and private entities for construction projects.[50]

The data in Table XI below highlight the impact of the Depression and New Deal on the course of public construction during the 1930s. Clearly, the Federal government came to

TABLE XI

PUBLIC WORKS IN THE GREAT DEPRESSION,
1930-1938
(in percent)

	1930	1931	1932	1933	1934	1935	1936	1937	1938	1935-[3] 1929	1933-[3] 1938
Public Construction to Total Construction	32	40	52	56	58	52	53	42	48	20	52
Public Construction to GNP*[1]	2.7	2.5	1.7	1.4	1.8	1.7	2.7	2.3	2.4	2.6	2.0
Public Construction to GNP	3.2	3.6	3.3	2.9	3.4	4.9	4.2	3.4	4.0	2.6	3.8
Federal Construction to Public Construction[2]	11	19	24	49	61	62	67	61	60	13	60
Federal Construction to Federal Expenditure	9.4	14.1	9.5	17.4	20.3	21.3	28.1	24.5	30.1	6.7	23.6
Road Construction to Public Construction	54	52	52	53	46	39	40	41	43	65	44
Conservation to Public Construction	5	6	8	22	24	32	19	20	17	4	22
River and Harbor Construction to Public Construction	3	3	5	5	5	7	3	6	4	4	5
Sewer and Water Construction to Public Construction	12	10	9	6	8	8	10	10	11	16	9

Source: Appendix tables III, V, and VII.

[1] GNP* is an estimate of capacity GNP computed by taking 1929 GNP as at capacity level and using a 3% trend growth rate.

[2] Figures include both direct Federal construction and grants in aid.

[3] Figures are annual averages.

dominate public construction during these years, and virtual parity came to exist between public and private building. These represent dramatic reversals from previous experience. And while the relative share of public works in total construction and of the Federal component have both declined since the 1930s, they have not returned to the pre-Depression levels. In addition, direct Federal construction plus grants in aid rose from about six percent of Federal spending during the late 1920s to between 25% and 30% during the mid-1930s. Public construction also increased relative to GNP, although this was due largely to the collapse in the latter figure, as public works failed to rise relative to a measure of capacity GNP during this period.

The project composition of public works also changed quite sharply. As the National Resources Planning Board summarized matters:

> As the proportion of public works increases relative to that of private construction, we tend to get, at any level of total construction, relatively fewer factories, office buildings, public utilities and housing, and relatively more highways, schools, recreational facilities and conservation work. Furthermore . . . within the field of public works, expenditures for conservation [and] the development of natural resources . . . are increasingly in significance.[51]

The Growth of Federal Conservation and Development

Conservation of natural resources had long been an interest of Franklin D. Roosevelt, and as Table XI indicates, a very large fraction of the increase in public construction during the New Deal was for these purposes.

The Agency longest involved in conservation and development was the Army Corps of Engineers. Since 1824 or so, it had been engaged in river and harbor improvement and, more recently, in flood control work. By 1930, the Corps had spent about $1.6 billion for these purposes, more than four-fifths of it on river and harbor work. The Mississippi River Commission had been set up by Congress in 1879 to deal with flood control problems on that river. By 1927 it had spent about $171 million of public money in largely fruitless efforts to stem periodic rampages by the father of waters. Finally, as noted above, the Bureau of Reclamation had, since 1902, been making public investments in Western irrigation projects. By 1930, it had expended some $200 million in public money on such projects.[52]

Under the New Deal, total spending on conservation and development rose sharply, new agencies became involved, and the kinds of projects undertaken changed sharply. From 1933-1938 expenditures averaged seven times as great as they had from 1925-1929, and rose from four percent to 22% of total public construction. The P.W.A. and W.P.A. expended large sums on conservation, and T.V.A. began in 1933. It marked the first large-scale experiment with multiple purpose river development. Bureau of Reclamation projects also expanded during the 1930s and they too shifted from being largely irrigation oriented to multiple purpose projects.

Only the Corps of Engineers failed to sail before this fresh breeze. After 1928, its flood control expenditures became increasingly important and, in 1936, when Congress assumed responsibility for flood control on all navigable rivers, expenditures exploded. Between 1931 and 1940 the Corps spent about $1.9 billion on water development--somewhat more than in the previous century--and about half of it was now devoted to flood control, mostly on the Mississippi River. It was only after 1945 that the Corps moved into multiple purpose water projects on a large scale.[53]

The Impact of Federal Public Works Spending in the 1930s

Virtually all economists are agreed that Federal spending had a relatively minor impact on the aggregate level of output and employment during the 1930s. Although the Federal deficit rose sharply, during the 1930s, it remained far too small to exert a major impact on total spending, and one economisthas estimated that the net increase in demand due to Federal fiscal policy amounted to no more than 2% to 3% of full employment GNP during these years.[54]

The regional distribution and impact of Federal public works was highly uneven during the 1930s, as Table XII indicates. However, because of the skewed distribution of regional per capita income, public works investments must have tended to be mildly equalizing in nature. Clearly, the biggest gainers by far were the Mountain states, followed by the Pacific and some Southern states. The Mid-Atlantic and East North Central States, all of which had per capita incomes well above the national average, received less than the national average of public works employment. In short, these figures suggest that the South and the West were already receiving a disproportionate share of Federal construction long before the current concern with such matters.

TABLE XII

REGIONAL IMPACT OF FEDERAL PUBLIC WORKS,
1935-1938
(in percent)

Region	Average Public Works Employment To Population	Regional Public Works to U.S. Public Works Employment	Regional Per Capita Personal Income to U.S. Average, 1940
New England	.33%	114%	121%
Middle Atlantic	.23	79	124
East North Central	.20	69	112
West North Central	.30	103	84
South Atlantic	.33	113	55
East South Central	.36	124	48
West South Central	.28	97	61
Mountain	.68	234	83
Pacific	.38	131	130
Total	.29	100	100

Source: Column one from John K. Galbraith, The Economic Effects of Federal Public Works Expenditures, 1933-1938 (Washington: U.S. National Resources Planning Board, 1940), table 15. Column three from Richard Easterlin, "Regional Income Trends, 1840-1950," in Robert Fogel, ed., Reinterpretation of American Economic History (New York: Harper & Row, 1971), pp. 38-49.

The regional distribution of public works expenditures was probably the outcome in part of their project composition. The sharp increase in the relative share of conservation projects in the form of TVA, Bonneville and Hoover Dams and similar projects surely tilted the distribution of public works to the Southern and Western states.

The range of projects which the Federal government supported during the 1930s is breathtaking. And in many cases, these represented wholly new initiatives--fields in which orthodox thinking had for years denied a Federal role. A listing of all such projects would be both stunning and dull, but a sampling is instructive. Federal funds built roads, sewers and waterworks. Enormous multiple purpose dams involved the Federal government in regional development for the first time. Large expenditures were also made on docks, wharves, roads and bridges. Airports, hospitals, and other public buildings, parks, works of art, public housing, and sewing projects give some idea of the range of activities that were Federal public works during the depression.[55]

In many cases, Federal spending prevented what would have been near eclipse of an entire generation of public construction projects. As Table XIII indicates, P.W.A. funds accounted for 35% to 50% of all new construction of sewer and water supply systems during the 1930s. Yet even with Federal funds, spending on these projects remained depressed. Without such aid they would have all but ceased to be built. America would have entered the war and postwar decades with an even smaller stock of public capital than in fact it did.

Public Works Administration sewer and water supply projects generated a variety of benefits to local and neighboring communities. Water supply systems, where there had been none before, sharply reduced fire insurance premiums. One P.W.A. study indicated that for 700 such systems, this gain alone resulted in a 1.4% return on investment, and in some communities it reached six percent. Similarly, with Federal funds totalling four million dollars, some sixteen communities along the Raritan River were able to build sewage treatment plants and sharply reduce its level of contamination. Aided with P.W.A. funds, Chicago constructed an emormous series of treatment plants to the considerable benefit of surrounding states and communities which had suffered from its pollution.[56]

The most enduring monuments of the 1930s have been the great multiple purpose river development projects--Bonneville Dam, Grand Coulee, Boulder Dam and, of course, T.V.A. And they stand apart not entirely because of the awesome size of the projects themselves. They represent the first Federal

TABLE XIII

TOTAL COST OF NEW CONSTRUCTION AND P.W.A. AID,
SEWER AND WATER WORKS, 1933-1937
(millions and percent)

	Sewage Systems			Water Works		
	Cost	P.W.A. Aid	Percent	Cost	P.W.A. Aid	Percent
1933	$45	$2	4%	$50	$1	2%
1934	102	38	37	71	25	35
1935	101	57	56	74	38	51
1936	230	109	48	112	69	62
1937	209	82	39	102	37	36

Source: P.W.A. aid from U.S. Public Works Administration, America Builds (Washington: U.S. Government Printing Office, 1939), table 9. Total cost figures from U.S. Department of Labor, Bureau of Labor Statistics, Expenditures for New Construction, 1915-1950 (Aug., 1950), table 1.

projects since the transcontinentals or perhaps the Panama Canal which materially affected the economic development of whole states and regions.

A variety of benefits flowed from these projects. For example, cheap electricity from T.V.A. and the Bonneville project transformed their regions and helped attract industry--most especially aluminum refining which is highly sensitive to energy costs. Writing in 1960, several authorities on regional economic development noted that

> each ton of aluminum requires 18,000 kilowatt hours of electricity. A difference of one mil in the rate will change the cost of electricity by $18.00 per ton--approximately 5% of its price.[57]

Between 1940 and 1949, seven aluminum refining plants were built in the United States--four in Washington state, one each in Alabama, Arkansas, and Oregon.

Cheap electricity from these and other Federal projects did more than attract industry; it transformed a whole way of life for rural America. Less than ten percent of all farms were served by electricity in 1930; by 1939, thanks to the stimulus afforded by Federal power projects and REA, the figure had risen to 30%. Slowly, the benefits of electric lighting and of power equipment, which had become increasingly available to urban residents during the 1920s, were entering the lives of farm families.

River development projects also provided other benefits. Flood control, irrigation, improved transportation all helped transform and develop the local economies. A summary of the economic impact of T.V.A. written by two economists in 1949 can probably stand for the other great projects of the 1930s as well. After noting that important as it was, T.V.A. had not been the dominating factor in Southern development, they concluded that

> the T.V.A. has been of real significance and value to the area affected. . . . [It] has provided industry where it was needed most, and it has raised incomes where they were lowest. It has facilitated balanced economic development of the area. It has put national resources to work and helped to conserve and improve soil and forest resources. In all of these respects, it has been a successful and profitable experiment.[58]

It would be wrong to conclude a discussion of the benefits of New Deal projects without noting the intangibles. Sometime after 1760, as Arnold Toynbee and others have noted, the English-speaking peoples began to rid themselves of the older medieval and mercantilist theories of the state and embrace the newer notions of social control embodied in Adam Smith's theory of free enterprise. In the Medieval world, the state and the Church, at least in theory, had been responsible for the detailed welfare of the citizenry, and the result was a whole host of laws, regulations and pronouncements on the proper course of economic activity. During the eighteenth and especially the nineteenth centuries, the theory that a self-regulating market obviated the need for such intervention gradually took hold; as it did the sphere within which state activity was conceived to run contracted. That the state was responsible for the economic welfare of its citizens took on a faintly subversive tinge. Such a doctrine, it was thought, would undermine initiative and encourage slothfulness.[59]

The public works of the 1930s sharply reversed this doctrine and represent, therefore, a return to an older view of the state. Both the broad spectrum of Federal projects and their clear purpose to provide relief implied that the Federal government accepted ultimate responsibility for the economic welfare of its citizens as it had not done before. To a man or woman out of work, public employment was an enduring statement that someone cared. Even black workers and female workers, although still discriminated against on Federal projects, were treated better than they had been by the private economy. Public works at least salvaged dignity and pride for millions of workers from the wreckage of the private economy.

Yet New Deal Public Construction was but a beginning. Federal employment was but a fraction of what was needed, and in the late 1930s it was sharply cut, expelling thousands into a private labor market with few jobs. Public construction of sewer and water projects still lagged, and T.V.A.--fought every step of the way by private power interests--remains a rather lonely monument. Much was left undone, but what resulted was a lasting monument to what the Federal government could do, in cooperation with its citizens, to provide for the common good. It was a vision of what is possible that continues to inspire and to repel down to this day.

World War II

As World War I finished off the Progressive Movement, so World War II brought a halt to the already faltering New Deal. The Old Order, which had so opposed the expansion of Federal public works to cure mass unemployment now--as interns to Dr. Win-the-War--rallied 'round the flag and actively promoted a vast expansion in public construction beyond the wildest dreams of the most avid New Dealer.

A Washington dinner party, held on December 4, 1941 captured the changes that were occurring. There were about twenty-four ex-business executives there, now high up in the defense effort. There was Frank Knox, Republican blue blood and Secretary of the Navy. Edward Stettinius was there--on loan from the House of Morgan, and ex-Chairman of the Board of U.S. Steel--as was William Knudsen, a General Motors alumnus and now head of the Office of Production Management. And there was Henry Wallace. "The heir-apparent of the New Deal Dynasty was mingling socially with blue-chip industrialists tonight, and nobody felt quite natural about it."[60]

This war-induced alliance of industrialists and New Dealers presided over the most spectacular expansion in non-military Federal public works in history. And while Federal construction boomed, it also changed more drastically in form than ever before. For the first time in history the Federal government entered into a massive program of industrial (i.e. factory plant and equipment) construction.

The following table presents some detailed data on public works investments during the World War II years, plus some information on the behavior of various components of private construction during the same period. It is not possible to estimate with any precision what these figures would have been in the absence of war. Hence, in the next-to-last column of Table XIV, 1940 is taken as a base and for each category the sum of the differences between actual yearly construction and construction at 1940 levels is computed. The last column expresses this total as a percentage of 1940 expenditures. For example, a figure of +361% in this column implies that wartime construction added 3.6 more years worth of building than would have occurred had construction continued at its 1940 pace.

Clearly the war had a decided impact on the aggregate level of non-military construction, on the composition of public works, and on the public-private balance. Total non-military building remained below 1940 levels throughout the war, the sum of the shortfall equalling about 1.38 years worth of

TABLE XIV

WORLD WAR II AND THE COMPOSITION OF PUBLIC AND PRIVATE CONSTRUCTION, 1940-1945
(millions of 1957-59 dollars and percent)

	1940	1941	1942	1943	1944	1945	Wartime Difference[1]	Differences as % of 1940 Level
Total Public Non-Military Construction	$8,057	$9,951	$12,747	$8,248	$4,964	$3,636	$ -739	-9%
Total Private Construction	14,105	16,049	8,234	4,474	4,803	7,181	-29,784	-211
Total Non-Military Construction	22,162	26,000	20,981	12,722	9,767	10,817	-30,523	-138
Total Industrial	1,791	5,566	8,877	4,546	3,395	3,156	+16,585	+926
Public Industrial	481	3,406	8,048	4,195	2,904	1,730	+17,878	+3,720
Private Industrial	1,310	2,160	829	351	491	1,426	-1,293	-98
Total Residential	8,895	10,168	5,603	3,870	2,314	2,762	-19,758	-222
Public Residential	529	1,056	1,260	1,647	436	154	+1,908	+361
Private Residential	8,366	9,112	1,647	2,223	1,878	2,608	-21,666	-121
Commercial	11,061	1,214	418	92	143	489	-41,900	-379
Roads	2,797	2,019	1,081	599	535	611	-9,140	-327
Other Public[2]	1,432	1,082	401	385	345	460	-4,847	-338
Other Private	3,323	3,563	2,644	1,808	2,281	2,658	-3,261	-98

Source: Appendix table IV.

[1]The sum of the differences between 1940 construction levels and actual construction, 1941-1945.

[2]Includes education, sewer and water works, conservation and miscellaneous other construction.

building at 1940 levels. As can be seen, almost all of this decline was in private building, as its shortfall amounted to about 2.11 years worth of building at 1940 rates.

Comparison of these figures with the 1930s is instructive. Between 1929 and 1934, the shortfall in total non-military construction amounted to 2.39 times 1929 levels, while the total decline in private building equalled 3.06 years worth of construction at 1929 levels. In short, the most expensive war in history, accompanied by detailed controls designed to restrict non-military economic activity, was vastly less expensive in terms of foregone construction than four years of depression had been. It is said that "big government" stifles private investment. Perhaps. But the experience of the 1930s and 1940s suggests that the big government and controls of World War II were a much less serious threat to private investment than was the free enterprise of 1929-1933.

Because the wartime years saw both a sharp change in the balance of public to private construction, and shifts in the composition of each of these, the following brief summary of major changes may be useful.

1. Total non-military construction had a shortfall equal to 1.38 times its 1940 level, almost all of the decline being private.

2. Traditional public construction--of roads, sewers, etc.--had a total shortfall equal to about 3.3 years of building at 1940 levels.

3. The decline in private residential building was not offset by the building of public housing, and the total shortfall in residential construction amounted to 2.2 years of 1940-level building.

4. The shortfall in private industrial building was far more than offset by public industrial building and total industrial building amounted to 9.37 times its 1940 level.

5. In sum, traditional public works, residential construction and commercial building were sacrificed, so that industrial construction could be expanded, but it was the public sector, not private enterprise, which built most of the new industrial plant.

Never before had the Federal government undertaken industrial construction on such a scale. The explanation for the public construction of industrial plant has a familiar ring:

it was the same reason that the states underwrote the ante-bellum transportation revolution. After a decade of depressed profits and with the wartime boom expected to be short lived, private enterprise was disinclined to risk the vast expansion of capital which would be necessary. Accordingly, investment in industrial plant became a public work, for the duration.

Between 1940 and 1945, the War Production Board and related agencies financed the construction of about $17 billion of new industrial plant and equipment, measured in current prices. About $11 billion of this total was considered usable for civilian production when the war ended. In combination with the $8.6 billion of privately financed manufacturing investment this equalled about half the gross book value of all manufacturing assets in existence in 1939. In short, manufacturing capital grew by about 50% during a five year period. In no previous period of American history for which data exist was manufacturing capital accumulated at such a rate, and 57% of it was built at public expense.[61]

The following tables describe the distribution of manufacturing capital formation by industry and by firm. The industrial groupings in Table XV are quite broad, and within them there is considerable diversity. Clearly, however, basic iron and steel capacity was enormously augmented by Federal construction, and the modern aircraft industry virtually sprang full blown from the Federal purse during these years. Almost all synthetic rubber came from government plants and the same was true of magnesium. On the average, about two-thirds of all the expansion in chemicals and allied products was Federally financed as was also the case for motor vehicles and parts.

The bulk of these facilities were operated by the largest 100 manufacturing firms then in existence, and these also tended to be the largest firms within their respective industries. The concentration of facilities expansion is indicated by Table XVI.

Consequences of Federal Wartime Construction

The geographic distribution of Federal wartime construction tended to reinforce the dispersion of manufacturing which was already occurring. Table XVII presents the regional distribution of both public and private construction for 1939, 1943, and 1945. In addition there are also data on the regional allocations of Federal wartime industrial construction, on the shares of manufacturing assets in 1939, and on regional per capita income as a percentage of the national average.

TABLE XV

INDUSTRIAL FACILITIES EXPANSION
July 1940 - June 1945
(millions of dollars and Percent)

Industry Group	Gross Property 1939	Usable Facilities Expansion			
		Total	Federally Financed	Private	Federally Financed as a Percent of 1939 Property
Metals and Metal Products	$13,334	$11,466	$8,389	$3,077	63%
Iron and Steel Products	6,349	3,202	2,156	1,406	34
Non-Ferrous Metals	979	1,772	1,364	408	139
Fabricating Industries	6,006	6,492	4,869	1,623	
Machinery except electric and transport	2,337	986	493	493	21
Electrical Machinery	845	583	283	300	34
Transport Equipment	2,824	4,923	4,093	830	145
Railroad equipment	554	30	3	27	.5
Aircraft	114	3,291	2,974	317	2,608
Ships and boats	162	616	491	125	303
Vehicles	1,994	986	625	361	31
Chemicals and Allied Products	2,180	2,872	2,080	792	95
Petroleum and Coal	7,565	1,439	537	902	7
Other Manufacturing	16,509	3,854	390	3,464	2
Not Classified	---	500	112	388	---
Total Manufacturing	39,588	20,131	11,508	8,623	29

Source: U.S. Congress, Senate, Committee on Small Business, Report of the Smaller War Plants Corporation, Economic Concentration and World War II, 79th Cong., 2d Sess., 1946, tables D-1 and D-2.

TABLE XVI

CONCENTRATION OF PRIVATELY OPERATED, GOVERNMENT OWNED FACILITIES' EXPANSION, JUNE 30, 1944
(millions of dollars)

Rank	Company	Value of Facilities Operated	Cumulative Value	Cumulative Percent
1	General Motors	$794.7	$794.7	7.1%
2	Alcoa	491.9	1,286.6	11.5
3	Curtiss-Wright	475.9	1,762.5	15.8
4	U.S. Steel	429.9	2,192.4	19.6
5	Ford	361.5	2,553.9	22.8
6	Bethlehem Steel	265.1	2,819.0	25.1
7	Chrysler	209.7	3,028.7	27.1
8	United Aircraft	206.2	3,234.9	28.9
9	Kaiser Industries	199.8	3,434.7	30.7
10	General Electric	198.9	3,633.6	32.5
	:			
	:			
	:			
50	Phillips Petroleum	44.0	7,012.0	62.7
	:			
	:			
	:			
100	Worthington Pump	19.1	8,390.8	75.0

Source: U.S. Congress, Senate Committee on Small Business, Report of the Smaller War Plants Corporation, Economic Concentration and World War II, 79th Cong., 2d Sess., 1946, table 14.

TABLE XVII

REGIONAL DISTRIBUTION OF PUBLIC AND PRIVATE CONSTRUCTION
1939-1946
(in percent)

Region	Regional Shares of Public Construction[1] 1939	1943	1946	Regional Shares of Private Construction 1939	1943	1946	Federal Wartime Industrial Construction 1940-45	Manufacturing Assets 1939	Regional Per Capita Income Relative to U.S. Average 1940
New England	6.4%	3.9%	5.0%	5.7%	4.7%	5.0%	4.4%	9.8%	121%
Middle Atlantic	17.1	13.8	17.0	22.3	12.8	15.1	15.7	29.8	124
East North Central	16.6	14.7	15.6	20.6	24.5	22.6	26.9	31.5	112
West North Central	9.0	8.0	7.8	7.8	10.2	8.0	6.7	5.5	84
South Atlantic	14.0	17.2	13.5	13.5	1.2	13.2	6.2	9.1	69
East South Central	8.4	6.8	7.7	3.6	4.0	4.5	4.9	3.4	55
West South Central	9.8	13.8	11.8	8.1	11.7	9.7	10.1	3.3	70
Mountain	7.0	7.3	5.2	3.3	4.7	3.4	5.3	1.1	92
Pacific	11.7	14.5	16.4	15.1	14.2	18.5	7.7	6.5	138

Source: Columns one - six, U.S. Department of Commerce, Geographic Distributions of Construction in the United States, 1939-1947 (January, 1948), tables IA and IB. Columns seven and eight from U.S. War Production Board, Wartime Production Achievements and the reconversion Outlook (Washington, 1945), p. 36. Column nine is from table XII above.

[1] Includes both military and non-military construction.

A glance at the data on public construction for any of the periods presented reveals that it was much less concentrated than were 1939 manufacturing assets. The Southern and Western states which, with the exception of the Pacific coast, were all relatively poor and unindustrialized, were clearly gaining relative to the Northeast and Middle West. But the reallocation of public construction which occurred from 1939-1945 does not fit this pattern very well. New England and the East North Central states lost shares, but so did Mountain and East South Central states.

Private construction in 1939 was much more heavily bunched in the older industrial states than were public works. Moreover, its reallocation from 1939-1946 fits the description of a move to the South and West more closely than do public works. While East North Central states gained two percentage points of private building, New England lost, and the Middle Atlantic states' share fell nearly seven points! Pacific, Mountain, East South Central and West South Central states all gained. Thus a reasonable summary of regional patterns might be that both public and private building were favoring the South and the West, but it was private construction more than public works which was increasingly favoring these regions.

The magnitude of Federal industrial public works meant that they exerted a significant influence on the postwar economy. As noted above, the Federal plants tended to be operated by already dominant firms. Indeed, they had to be, as so much of the new construction was "scrambled." That is, it was integrated with, or was contiguous to, privately owned plant of the companies which ran it during the war. In steel, some 60% of new facilities were scrambled. Such scrambled facilities had only one logical buyer after the war. But even where facilities were not scrambled, they often went to the largest producers in an industry, thereby cementing those firms' market power. Table XVIII, which lists some of the industrial facilities sold during 1946, gives an idea of who the buyers tended to be. The prime example of how disposal policy helped maintain market power was the sale of the Geneva steel plant to U.S. Steel in the second quarter of 1946. As a result of this sale, U.S. Steel, which had long been the dominant firm in eastern markets, now achieved a substantial share of the increasingly important western markets too. The only major exception to the generalization that disposal policy augmented market power is the aluminum industry. Here the disposal of Federal plants led to the entry of Reynolds and Kaiser and transformed Alcoa's longstanding monopoly into what has proved to be a durable oligopoly.

TABLE XVIII

SALES OF LARGE INDUSTRIAL PLANTS DURING THE SECOND AND FOURTH QUARTERS, 1946
(millions and percent)

Wartime Operator	Plant Cost	Selling Price	Price to Cost	Purchaser
U.S. Steel Geneva Plant	$200.6	$47.5	24%	U.S. Steel
Carnegie Steel, Homestead Plant	86.5	44.1	51)	
Carnegie Steel, Braddock Plant	22.8	14.4	63)	Carnegie Steel
Carnegie Steel, Duquesne Plant	10.8	6.5	60)	
Buckeye Ordinance Plant	40.4	12.5	31	Solvay-Process Co.
Coosa River Ordinance Plant	16.0	1.4	9	Coosa Valley Development Co.
Republic Steel, Chicago Plant	91.1	35.0	38	Republic Steel
Inland Steel, Chicago Plant	34.3	13.3	39	Inland Steel
Dow Magnesium Plant	30.4	20.1	66	Dow Magnesium
Dow Chemical Plant	17.1	14.5	85	Dow Chemical
Douglas Aircraft Plant	11.9	3.7	31	Douglas Aircraft
Olin Industries Plant	6.3	3.0	48	Permanente Metals
Alcoa Plant	6.2	2.5	39	Kelsey-Hayes Wheel Co.
Douglas Aircraft Plant	5.8	3.8	65	Douglas Aircraft
Nash-Kelvinator Plant	5.2	1.0	20	Nash Kelvinator
Totals	$585.3	$191.7		
Average Price/Cost			33%	

Source: U.S. War Assets Administration, Quarterly Progress Reports, Second Quarter, 1946 and Fourth Quarter, 1946, pp. 35 and 15 respectively.

A final result of Federal disposal policy was on the distribution of wealth. The total value of plant disposed to private industry is not known, but it could have been as high as $11 billion. As disposal prices seem to have been about thirty-three cents on the dollar, the value of the gift may have been as high as $7.3 billion. This windfall would have accrued to the holders of corporate common stock, and as the top one percent of the wealth distribution held about 62% of such stock in 1945, they probably got that share of the windfall, or about $4.5 billion. Assuming conservatively that this raised the value of their stock by no more than $4.5 billion--i.e. that its book value equalled its market value--then the windfall could have amounted to as much as 2.5% of the net wealth of the top one percent of all wealth holders in 1945.

From World War II to 1960

Although it is true that the share of government in economic activity has expanded since World War II, that is not an entirely accurate summary of the course of public construction during these years. Simon Kuznets' data for overlapping long periods show that the share of government in domestic capital formation was less in the 1946-1955 period than in either 1929-1955 or 1919-1948. Data on construction rather than total capital formation, and using different time periods, are presented in Table XIX below, and yield substantially similar results. The first postwar decade (1946-1955) shows a government share in construction that is only two percentage points higher than in 1920-1929. In 1958, the government's share reached 26% of the total, and thereafter it has exhibited no trend.

The Federal share of public construction behaves in similar fashion at least up through the middle 1960s. It is about half what it was from 1935-1945 and shows no obvious trend during the first two postwar decades.

Return to Normalcy, 1945-1950

Non-military, non-residential Federal public works very quickly returned to "normal" after World War II. In real terms, Federally funded public works were less in both 1946 and 1947 than they had been during the 1930s. They rose sharply thereafter, however, nearly doubling from 1947-1950. Much of this growth was due to a $500 million increase in expenditures on conservation and rivers and harbors (see Appendix, Table III).

TABLE XIX

TRENDS IN THE SHARE OF GOVERNMENT AND OF FEDERAL GOVERNMENT IN CONSTRUCTION, 1920-1970
(in percent)
Data are Annual Averages

Year	Public/Total[1]	Federal/Public
1920-29	20%	11%
1935-45	39	72
1946-56	22	36
1946-70	26	37
1956-70	28	35

Source: Appendix tables III and VI.

[1]Public construction excludes military and public residential construction.

Much more important was the sharp rise in state and local construction, from $600 million in 1945 to $1.4 billion in 1946, and then to $5.2 billion in 1950. Most of the increase came in three areas--sewer and water works, school building, and road construction, as states and localities attempted to make up for a decade and a half of reduced activity due to depression and war. All together, such demands led to a 45% expansion in public construction from its low point in 1946 to 1950. Private building rose even more--by 61% over the same period. Thus, even in the face of unprecedented demands for public works, the ratio of public to total construction actually declined during these years.

Conservation and Development in the Postwar Period

Like most spending not considered vital to the war effort, water resource development was sharply curtailed by World War II. After the war, however, spending rose sharply from a low of $130 million in 1945 measured in current dollars to $942 million in 1950 when it accounted for 15% of total public construction; thereafter expenditures ranged from 7% to 10% of public building compared with 4% to 5% during the 1920s.

Both the Corps of Engineers and the Bureau of Reclamation participated in this expansion. Bureau appropriations rose from $42 million in 1945 to $367 million in 1950; thereafter they fluctuated between $160 to $200 million to 1957. (Bureau expenditures are contained in Table VI above.) Corps expenditures on river and harbor work alone averaged $80 million per year from 1945-1961, totalling some $1.2 billion over the period. But Corps projects were becoming increasingly concerned with flood control and multiple purpose river development. From 1945 to 1962, $2.7 billion was expended on Corps flood control projects, and by 1950, an additional $1 billion had been spent on projects which included electricity generation as a goal. Total water resource development spending by the Corps from 1941-1956 (most of it after 1945) came to $6.3 billion, and an additional $4.9 billion was appropriated between 1957 and 1962.[62]

Korea, The Baby Boom and the Interstate Highways, 1950 on

War in Korea again brought the Federal government into the construction of industrial plant--and for the same reasons as had World War II. From 1952-1954, about $5 billion of such "public works" were built, compared with some $6.5 billion

of privately financed industrial construction during the same period.

Korea's impact on public works was ephemeral; the baby boom, the automobile, and increasing urbanization were not. Schools, roads, and public health investments together accounted for about 90% of the increase in public construction from 1950-1960, and road construction alone amounted to 62% of the rise in public building.

Between 1940 and 1950, the population aged five to nineteen had remained constant, but school enrollment rates rose from 74.8% to 78.7% of this age group. Between 1950 and 1960, however, enrollment rates rose even more sharply--to 84.4% of the school age population--and at the same time the populance in the five to nineteen age bracket rose from 34.9 million to 48.5 million, or by 39%. Finally, college enrollments boomed during this decade also. Rising incomes, the G.I. Bill, and changing views on higher education for women raised enrollments from prewar levels of about 7%-8% of the eighteen to twenty-four year old age group up to 10% by 1946 and 20% by 1960.

The not-too-surprising result of these educational changes was an unprecedented demand for new schools, and real construction expenditures rose by 72% between 1950 and 1960.

In real terms, expenditures on sewer and water works rose 46% during the decade of the 1950s. Increased urbanization was one of the causes, as city populations expanded by a third over the decade. To some extent, however, construction must have been an effort to catch up with a decade and a half of reduced building during the 1930s and World War II.

Finally, the ten years after 1950 saw the beginning and much of the construction of the largest public work to date in American history--the interstate highway system. Federal grants to states for road construction go all the way back to 1916, and in 1918, some $2.1 million was so granted. To this modest sum, the states added $137 million of their own funds. By 1950, these funds had expanded considerably: in current dollars, road construction amounted to some $2.1 billion. During that year, somewhat less than 20,000 miles of Federally aided highways were constructed. In 1960, 32,000 miles of interstate were built with the Federal government picking up about 70% of the tab. Total expenditures on roads and highways amounted to $5.4 billion in current dollars which was 40% of all non-military, non-residential public construction.

The economic and social consequences of massive highway investments during the postwar years are only now coming to be understood. During the peak years of the early 1960s road construction amounted to some 12% of total construction making it even more significant than during the halcyon years of the 1920s. The building of superhighways through and around cities made a major contribution to suburbanization. As a result it sharply augmented the demand for such public works as sewers, streets, water systems and schools while contributing to their underutilization and deterioration in downtown areas. Additional highway construction continued the long-term decline of railroad traffic and revenues. By the 1970s, however, it had finally dawned that profitable or not they were a vital part of the economic infrastructure. Accordingly, with AMTRAK and CONRAIL, a massive Federal program of maintenance and rehabilitation investment was begun.

Although it encouraged suburbanization and discouraged private railroad investment, highway construction after 1950 does not seem to have the other linkage effects which made it the dynamic element in the economy of the 1920s. The stock of cars which grew rapidly during the 1920s, had stabilized at the ratio of about one for every two people, and total automobile related expenditures stabilized at 10% to 13% of total consumer demand. Clearly, the industry had stabilized and matured.[63] And in the rising concern with pollution and suburban sprawl, there is some evidence that it has begun a slow decline.

To the Present, Summary and Conclusion

As we have seen, in the early years of the Republic, the category of permissible state activities was broad indeed. Both mercantilist notions plus ideas gleaned from the philosophers of free enterprise supported the positive conception that the state should promote economic activities which would release private energies. This rubric, plus provision for the national defense, allowed the support of a broad range of projects. Although Federal activities were circumscribed by state and regional rivalries, government at all levels invested in transportation, carried out surveys, built banks, supported schools and otherwise helped create the infrastructure of economic development. Yet the emphasis on activities which supported private economic development resulted in the neglect of those projects which, however necessary, had no very clear connection to development. Thus, most urban services were initially left to private enterprise, and only became public works after private activities had proved a dismal failure. And when public they usually lagged behind demands.

This impetus of government developmental activities carried over into the 1870s. Thereafter, as private capitalism came of age, the need for such activities declined. Thus, at the same time that the Supreme Court in Munn vs. Illinois (1877) was affirming the power of the state to regulate businesses "affected with a public interest," state promotion of such activities was declining. Government public works now concentrated somewhat less on promoting private enterprise than on accommodating to it by picking up the social costs of privately motivated economic development. Industrialization had led to urbanization which in turn resulted in massive investments in streets, sewers, water works, bridges, transport systems and other services. Most were done by the cities themselves, and while some were still developmental, others were belated efforts to correct the damages wrought by unregulated urbanization. In the aggregate, these urban public works grew enormously, and so public building grew in relation to private construction from about 1900 on.

The twentieth century brought government at all levels back into transportation investment. The enormous road and automobile boom which culminated in 1929 was the dynamic developmental force in economic development for the first two decades of this century. Its significance was comparable to the canal boom of the 1830s and 1840, and to railroadization during the 1880s.

With depression and war, the Federal component of public works became paramount for the first time, and large-scale developmental projects were again begun. New justifications for public construction appeared, and a great range of projects were tentatively begun. As we shall see below, the intellectual lineage of New Deal thinking has supported, in the 1960s and 1970s, a considerable broadening of the activities treated as public works. War has had a similar impact. Industrial construction became a public work during both World War II and Korea. And, national defense--as it had helped rationalize Federal support for transcontinental railroads--also was a motive in back of the interstate highway system. Continuing urbanization and suburbanization have also resulted in large demands for urban transit systems, and for expanded sewerage and water treatment facilities, while the postwar baby boom led to a similar expansion in school construction.

Thus after some experimentation in the war and depression decades, it would seem as if public works have returned to their conventional categories. Construction of roads, schools, sewers and water works amounted to 70% of all non-military, non-residential government construction in 1970.

However, to take these and the other conventional categories as the scope of modern public works is to run the risk of being severely and increasingly out of date.

If historical analysis accomplishes anything, it indicates that the project composition of public works has been highly variable over time, as have the means by which such projects are financed. As the economy evolves and the demands of the population change, what is public changes too. Water works were once private. Now, mostly, they are not. Industrial construction has been public, usually it is not. The present categories of activities which we term public works are those which evolved out of the peacetime years between 1870 and 1932. They did not fit the antebellum years very well, and it seems that they are becoming increasingly out of touch with present reality.

The activities which we actually treat as public works have been expanding rapidly in the recent past, even though we still think in terms of the stylized categories of some fifty years ago. This expansion in the public sphere has come about for essentially two sets of reasons. First of all, in an increasingly urban economy, all investments become more and more public. In economic jargon, external costs and benefits which are not accurately reflected in market prices become more and more severe. The most obvious example is pollution. Federal air and water quality standards have stimulated some conventional public works, as municipal sewage and solid waste disposal has been upgraded. But in addition, they have led to a whole new category of "public" investment. Federally mandated but privately financed pollution abatement investments are public works by any reasonable definition. And they are an important one--private investments in anti-pollution devices averaged between 5% and 6% of all business investment during 1976 and 1977. Similarly, changes in the private economy plus evolving ideas about workplace safety are generating privately financed but publicly mandated investments in occupational health and safety. It is a gross but useful oversimplification to say that before 1870 we treated private investments as public works and subsidized them. Later we socialized the costs of private economic development with publicly financed public works. Now we are forcing private enterprise to finance public works to internalize its own social costs.

But there are other reasons for this continued blurring of the public and private sectors. The nineteenth-century emphasis on balanced budgets limited the ability of governments to undertake public works or to subsidize private enterprises. This reinforced the on-the-whole accurate notion that most

private investments really were private and should have to pass the market test of profitability. In addition, a variety of legitimating beliefs supported the notion that a market determined distribution of income and wealth was a just one.

Since the 1930s, each of these beliefs has eroded. Public works financed through unbalanced budgets are justified by their impact on the unemployment rate. A variety of unprofitable activities may be subsidized even where there are no obvious externalities because they are somehow worthy of public support or because those who undertake them are deemed to be especially deserving of public aid. The categories of "property affected with a public interest" have expanded wonderfully since Chief Justice Waite first set them out a century ago in Munn vs. Illinois. A Joint Economic Committee study indicated that a minimum estimate of the size of Federal subsidy programs in fiscal year 1970 was $63 billion.[64] Most of these support a current economic activity rather than some form of capital formation. But in a fundamental sense, all income is a yield on capital, and so programs which augment income streams must also shape the rate and direction of private investment.

So it seems we have come full circle since the eighteenth century. The old and rather broad mercantilist notion of public activities eroded during the late nineteenth century. But rumors of its death were exaggerated. Since the Great Depression public works as traditionally defined have seen a relative expansion. But there has been a much greater expansion in publicly mandated private investments and in public subsidy programs. Neither of these is usually thought to be a public work in the traditional definition. But all are works which it is apparently thought in the public interest to encourage.

APPENDIX

APPENDIX TABLE I

PERCENTAGE SHARES OF GOVERNMENT IN TOTAL REPRODUCIBLE WEALTH, U.S.
(including nonprofit institutions)

Year	Structures	
	Current Prices	1929 Prices
1805	3.4%	3.9%
1850	2.9	3.1
1880	2.4	2.7
1890	2.8	2.8
1900	3.5	3.5

Source: Raymond Goldsmith, "The Growth of Reproducible Wealth in the United States from 1805-1950," in Simon Kuznets, ed., Income and Wealth of the United States, Income & Wealth Series II (Cambridge: Bowes and Bowes, 1952), pp. 247-328, table I.

APPENDIX TABLE II

FIVE YEAR MOVING AVERAGES OF GOVERNMENT GROSS CONSTRUCTION, CURRENT AND 1929 PRICES, 1869-1955

Year on which moving average is centered	Current Prices			1929 Prices		
	Government, excluding military	Government to GNP	Government/ Total	Government, excluding military	Government to GNP	Government/ Total
	(billions and percent)					
1871	$0.06	.9%	7.8%	$0.11	1.2%	7.3%
2	0.06	.9	7.4	0.12	1.3	7.6
3	0.06	.8	7.0	0.13	1.3	7.7
4	0.07	.9	7.8	0.13	1.2	7.1
5	0.07	.9	8.0	0.14	1.2	7.7
1876	0.06	.8	7.2	0.14	1.2	7.6
7	0.06	.8	7.3	0.15	1.1	7.9
8	0.07	.8	8.4	0.15	1.0	7.7
9	0.07	.8	7.7	0.16	1.0	7.5
1880	0.08	.8	8.0	0.17	1.0	7.4
1	0.08	.8	7.2	0.18	1.0	7.3
2	0.09	.8	7.3	0.19	1.0	7.0
3	0.09	.8	6.8	0.20	1.0	6.9
4	0.10	.9	7.1	0.21	1.0	7.0
1885	0.10	.9	6.7	0.22	1.1	6.6
6	0.10	.9	6.4	0.23	1.1	6.6
7	0.11	.9	6.9	0.24	1.1	6.6

APPENDIX TABLE II--continued

Year on which moving average is centered	Government, excluding military	Government to GNP	Government/ Total	Government, excluding military	Government to GNP	Government/ Total
	Current Prices			1929 Prices		
	(billions and percent)					
1888	$0.11	.9%	6.1%	$0.25	1.1%	6.1%
9	0.12	1.0	6.3	0.27	1.2	6.2
1890	0.12	1.0	5.7	0.28	1.1	5.7
1	0.13	1.0	5.9	0.30	1.2	5.7
2	0.13	1.0	5.6	0.32	1.2	5.8
3	0.14	1.0	6.2	0.33	1.2	5.9
4	0.14	1.1	6.3	0.34	1.2	6.2
1895	0.14	1.1	6.7	0.36	1.3	6.7
6	0.15	1.1	7.3	0.37	1.3	7.1
7	0.16	1.1	7.8	0.39	1.3	7.6
8	0.17	1.1	8.1	0.41	1.3	7.9
9	0.18	1.1	8.0	0.43	1.2	7.9
1900	0.20	1.1	8.1	0.46	1.3	8.0
1	0.22	1.1	8.2	0.50	1.3	8.3
2	0.25	1.2	8.7	0.55	1.4	8.6
3	0.28	1.3	9.2	0.61	1.5	9.1
4	0.31	1.4	9.4	0.65	1.5	9.3
1905	0.35	1.4	9.9	0.71	1.5	9.9

APPENDIX TABLE II--continued

Year on which moving average is centered	Government, excluding military	Government to GNP	Government/ Total	Government, excluding military	Government to GNP	Government/ Total
	Current Prices			1929 Prices		
	(billions and percent)					
1906	$0.40	1.6%	10.8%	$0.79	1.7%	10.7%
7	0.43	1.6	10.8	0.83	1.7	10.8
8	0.46	1.6	10.9	0.88	1.8	11.0
9	0.50	1.7	11.8	0.95	1.9	12.2
1910	0.53	1.7	12.3	0.99	1.9	12.3
1	0.55	1.7	12.2	1.01	1.8	12.2
2	0.58	1.7	13.3	1.06	1.9	13.3
3	0.62	1.8	14.9	1.12	2.0	14.8
4	0.64	1.7	15.3	1.12	1.9	15.1
1915	0.66	1.6	15.8	1.09	1.8	15.7
6	0.68	1.4	16.1	1.02	1.7	16.1
7	0.73	1.3	15.3	0.95	1.5	15.2
8	0.82	1.2	15.2	0.87	1.3	14.4
9	0.99	1.4	16.9	0.92	1.4	15.4
1920	1.19	1.6	18.3	1.08	1.6	16.6
1	1.37	1.8	18.4	1.21	1.7	16.6
2	1.57	2.0	18.9	1.39	1.9	17.0
3	1.76	2.3	18.8	1.61	2.1	16.9
4	1.88	2.3	17.7	1.75	2.2	16.2

APPENDIX TABLE II--continued

Year on which moving average is centered	Government, excluding military	Government to GNP	Government/ Total	Government, excluding military	Government to GNP	Government/ Total
	Current Prices			1929 Prices		
	(billions and percent)					
1925	$2.03	2.4%	17.7%	$1.88	2.2%	16.2%
6	2.20	2.5	18.5	2.09	2.4	17.3
7	2.32	2.5	19.3	2.24	2.5	18.4
8	2.46	2.7	21.6	2.45	2.7	20.9
9	2.56	2.9	24.9	2.66	2.9	25.1
1930	2.44	3.0	28.6	2.72	3.2	30.2
1	2.27	3.2	33.7	2.61	3.3	35.8
2	2.21	3.5	41.9	2.57	3.3	43.5
3	2.08	3.5	47.5	2.43	3.4	48.2
4	2.26	3.8	51.2	2.52	3.4	50.3
1935	2.50	3.8	48.4	2.60	3.3	46.8
6	2.85	4.0	47.3	2.89	3.4	45.9
7	3.16	4.2	45.4	3.19	3.5	44.4
8	3.37	4.2	42.9	3.38	3.5	42.3
9	3.50	4.0	39.0	3.42	3.3	38.6
1940	4.01	4.2	38.6	3.71	3.5	37.9
1	4.10	3.9	38.7	3.62	3.2	37.4
2	3.80	3.2	38.0	3.23	2.8	36.4

APPENDIX TABLE II--continued

Year on which moving average is centered	Government, excluding military	Government to GNP	Government/ Total	Government, excluding military	Government to GNP	Government/ Total
	Current Prices			1929 Prices		
	(billions and percent)					
1943	$3.50	2.7%	36.9%	$2.84	2.4%	35.4%
4	3.11	2.2	32.6	2.39	1.9	32.3
1945	2.62	1.6	25.7	1.90	1.5	27.5
6	2.80	1.5	21.5	1.81	1.3	23.2
7	3.61	1.8	21.7	2.13	1.5	23.0
8	4.63	2.1	21.8	2.58	1.7	23.0
9	5.90	2.5	23.3	3.08	2.0	24.8
1950	7.16	2.8	24.9	3.55	2.2	26.3
1	8.24	3.1	26.1	3.95	2.4	27.4
2	9.17	3.2	26.4	4.27	2.5	27.9
3	10.0	3.0	26.4	4.54	2.6	28.0

Source: Simon Kuznets, Capital in the American Economy (National Bureau of Economic Research, 1961), Table R-30. Figures exclude military construction. GNP data used are Kuznets'Variant I from Tables R-25 and R-26.

APPENDIX TABLE IIA

FIVE YEAR MOVING AVERAGES OF GOVERNMENT NET CONSTRUCTION AND DEPRECIATION, CURRENT AND 1929 PRICES 1869-1955 (billions and percent)

Year	Current Prices			1929 Prices		
	Net Construction	Depreciation	Net to GNP	Net Construction	Depreciation	Net to GNP
1871	$.02	$.03	.5%	$.05	$.06	.6%
2	.03	.03	.4	.06	.06	.6
3	.03	.03	.4	.06	.06	.6
4	.03	.03	.4	.07	.07	.6
1875	.03	.03	.4	.07	.07	.6
6	.03	.03	.4	.07	.07	.6
7	.03	.03	.4	.07	.08	.6
8	.03	.04	.4	.08	.08	.6
9	.03	.04	.4	.08	.08	.5
1880	.04	.04	.4	.09	.08	.5
1	.04	.04	.4	.09	.09	.5
2	.04	.04	.4	.10	.09	.5
3	.05	.04	.5	.11	.10	.5
4	.05	.05	.5	.11	.10	.5
1885	.05	.05	.5	.11	.10	.5
6	.05	.05	.5	.12	.11	.6
7	.06	.05	.5	.13	.11	.6
8	.06	.05	.5	.13	.12	.6
9	.06	.06	.5	.14	.12	.6
1890	.06	.06	.5	.16	.13	.7

APPENDIX TABLE IIA--continued

Year	Current Prices			1929 Prices		
	Net Construction	Depreciation	Net to GNP	Net Construction	Depreciation	Net to GNP
1891	$.07	$.06	.5%	$.16	$.14	.7%
2	.07	.06	.5	.18	.14	.7
3	.07	.06	.5	.18	.15	.7
4	.07	.06	.5	.19	.16	.7
1895	.08	.07	.6	.20	.16	.7
6	.08	.07	.6	.20	.17	.7
7	.08	.08	.6	.21	.18	.7
8	.09	.08	.6	.22	.19	.7
9	.10	.09	.6	.23	.20	.7
1900	.10	.09	.6	.25	.21	.7
1	.12	.10	.6	.28	.22	.7
2	.14	.11	.7	.32	.23	.8
3	.16	.12	.7	.36	.24	.9
4	.18	.13	.8	.40	.26	.9
1905	.21	.14	.9	.44	.27	.9
6	.24	.15	1.0	.50	.29	1.1
7	.26	.16	1.0	.52	.30	1.1
8	.28	.18	1.0	.56	.32	1.1
9	.32	.19	1.0	.61	.34	1.2
1910	.32	.20	1.0	.63	.36	1.2
1	.33	.22	1.0	.62	.39	1.1
2	.35	.23	1.0	.65	.41	1.2

APPENDIX TABLE IIA--continued

Year	Current Prices			1929 Prices		
	Net Construction	Depreciation	Net to GNP	Net Construction	Depreciation	Net to GNP
1913	$.37	$.25	1.1%	$.68	$.44	1.2%
4	.37	.27	1.0	.66	.46	1.1
1915	.35	.31	.8	.60	.49	1.0
6	.32	.36	.6	.51	.51	.9
7	.29	.44	.5	.41	.54	.7
8	.28	.54	.4	.31	.56	.5
9	.38	.62	.5	.34	.58	.5
1920	.52	.66	.7	.47	.60	.7
1	.65	.72	.9	.58	.63	.8
2	.81	.76	1.0	.72	.66	1.0
3	.99	.77	1.2	.91	.70	1.2
4	1.08	.81	1.3	1.00	.75	1.2
1925	1.17	.86	1.4	1.09	.79	1.2
6	1.31	.89	1.5	1.24	.85	1.4
7	1.38	.94	1.5	1.34	.90	1.5
8	1.49	.97	1.6	1.48	.97	1.5
9	1.56	1.00	1.8	1.62	1.04	1.6
1930	1.45	.99	1.9	1.61	1.11	1.9
1	1.25	1.02	1.7	1.43	1.18	1.8
2	1.13	1.08	1.8	1.32	1.25	1.8
3	.95	1.14	1.6	1.11	1.31	1.5
4	1.03	1.23	1.7	1.14	1.38	1.5

APPENDIX TABLE IIA--continued

Year	Current Prices			1929 Prices		
	Net Construction	Depreciation	Net to GNP	Net Construction	Depreciation	Net to GNP
1935	$1.14	$1.37	1.7%	$1.16	$1.44	1.5%
6	1.38	1.47	2.0	1.39	1.50	1.6
7	1.61	1.54	2.1	1.61	1.57	1.8
8	1.74	1.63	2.2	1.73	1.65	1.8
9	1.76	1.73	2.0	1.69	1.73	1.7
1940	2.10	1.91	2.2	1.90	1.81	1.8
1	1.98	2.12	1.9	1.73	1.89	1.6
2	1.50	2.30	1.3	1.27	1.96	1.1
3	1.03	2.47	0.8	.82	2.01	0.7
4	.44	2.66	0.3	.34	2.05	0.3
1945	-.24	2.86	-0.1	-.18	2.08	-0.1
6	-.32	3.12	-0.2	-.29	2.10	0.2
7	.20	3.41	0.1	[a]	2.12	---
8	.91	3.72	0.4	.42	2.16	0.3
9	1.84	4.06	0.8	.88	2.20	0.6
1950	2.78	4.38	1.1	1.30	2.20	0.8
1	3.60	4.65	1.3	1.64	2.25	1.0
2	4.22	4.95	1.5	1.90	2.31	1.1
3	4.70	5.33	1.6	2.10	2.31	1.2

Source: Simon Kuznets, Capital in the American Economy: Its Formation and Financing (National Bureau of Economic Research, 1961), tables R-31 and R-32, Military construction is excluded. The GNP data used are Kuznets' Variant I from tables R-25 and R-26.

[a]Less than $5 million.

APPENDIX TABLE III

PUBLIC CONSTRUCTION AND SOME OF ITS COMPONENTS
(millions of current dollars and percent, 1915-1970)

Year	Non-Residential Non-Defense Public Construction	Education	Roads	Conser-vation	Sewer & Water	Public as a Percent of Total
1915	$702		$302	$36	$106	22%
6	687		314	28	95	18
7	671		320	27	91	15
8	683		296	29	94	13
9	887		429	39	124	14
1920	1191	$190	656	55	153	18
1	1515	274	853	52	178	25
2	1659	342	876	48	201	22
3	1606	346	805	65	203	17
4	1892	353	987	79	263	18
1925	2130	400	1082	73	278	19
6	2133	399	1067	61	285	18
7	2397	367	1222	63	312	20
8	2470	378	1289	72	300	21
9	2467	389	1266	115	253	23
1930	2829	364	1516	137	343	32
1	2619	285	1355	156	270	41
2	1828	130	958	150	156	52
3	1612	52	847	359	95	56
4	2163	148	1000	518	173	58

APPENDIX TABLE III--continued

Year	Non-Residential Non-Defense Public Construction	Education	Roads	Conser-vation	Sewer & Water	Public as a Percent of Total
1935	$2187	$153	$845	$700	$175	52%
6	3426	366	1362	658	342	53
7	2966	253	1226	605	311	42
8	3323	311	1421	551	355	48
9	3619	468	1381	570	371	44
1940	3043	156	1302	528	338	35
1	3701	158	1066	500	252	31
2	5099	128	734	357	169	36
3	3033	63	446	285	107	36
4	2025	41	362	163	79	38
1945	1628	59	398	130	97	28
6	1669	101	764	260	194	12
7	2915	287	1344	424	351	15
8	4390	618	1661	670	535	17
9	5773	934	2015	852	619	22
1950	6344	1133	2134	942	659	19
1	7773	1513	2355	912	775	22
2	8728	1619	2677	900	790	24
3	9396	1714	3021	892	883	24
4	10373	2134	3714	773	982	25

APPENDIX TABLE III--continued

Year	Non-Residential Non-Defense Public Construction	Education	Roads	Conser-vation	Sewer & Water	Public as a Percent of Total
1955	$10162	$2442	$3852	$701	$1085	22%
6	11080	2556	4415	826	1275	23
7	12260	2825	4934	971	1344	25
8	13209	2875	5545	1019	1387	26
9	13643	2656	5761	1121	1467	25
1960	13781	2818	5437	1175	1487	25
1	14935	3052	5854	1384	1581	26
2	15665	2984	6365	1523	1754	26
3	17647	3477	7084	1694	1829	27
4	18906	3790	7133	1750	2281	28
1965	20629	4284	7550	2019	2461	28
6	22625	5333	8405	2194	2366	30
7	24131	5988	8591	2124	2328	31
8	26051	6061	9321	1973	3065	30
9	26038	5868	9250	1783	2680	28
1970	26271	5619	9981	1908	2638	28

Source: U.S. Bureau of the Census, Historical Statistics of the U.S. Colonial Times to 1970, Bicentennial Edition (Washington, D.C., 1975), Series N 1-29.

APPENDIX TABLE IV

PUBLIC CONSTRUCTION AND SOME OF ITS COMPONENTS
(millions of 1957-59 dollars and percent, 1915-1970)

Year	Non-Residential Non-Defense Public Construction	Education	Highways and Roads	Conser-vation	Sewer & Water	Public as a Percent of Total
1915			$763	$224	$659	
6			749	138	470	
7			663	100	335	
8			507	97	314	
9			665	119	380	
1920	$2099	$459	783	134	372	14%
1	3300	866	1228	159	544	20
2	4038	1167	1384	161	676	18
3	3558	1053	1141	190	594	13
4	4204	1087	1459	232	770	15
1925	4937	1258	1681	219	836	16
6	5048	1255	1725	184	858	15
7	5680	1154	2004	188	935	17
8	5947	1189	2260	216	902	19
9	6006	1223	2296	341	751	21
1930	7230	1241	2958	415	1038	29
1	7437	1093	2951	502	869	38
2	6116	572	2623	551	573	50
3	4540	228	1819	1101	330	49
4	5578	584	1899	1422	511	52

APPENDIX TABLE IV--continued

Year	Non-Residential Non-Defense Public Construction	Education	Highways and Roads	Conser-vation	Sewer & Water	Public as a Percent of Total
1935	$5872	$628	$1681	$1932	$ 540	46%
6	8883	1441	2497	1794	943	47
7	7175	853	2396	1513	798	38
8	8139	1037	2893	1397	879	43
9	9251	1555	2877	1441	945	41
1940	7528	484	2797	1336	855	32
1	8895	464	2019	1230	609	30
2	11487	366	1081	913	400	36
3	6601	171	599	702	264	37
4	4528	109	535	390	190	39
1945	3482	147	611	299	225	28
6	2918	213	1067	529	397	11
7	4298	449	1652	737	613	15
8	5890	859	1831	1048	838	17
9	8170	1302	2684	1298	945	22
1950	8603	1543	2722	1351	947	20
1	9462	1943	2430	1238	1054	22
2	10199	1997	2681	1175	1030	24
3	10832	2029	3209	1109	1095	24
4	11911	2466	4109	917	1164	25

APPENDIX TABLE IV--continued

Year	Non-Residential Non-Defense Public Construction	Education	Highways and Roads	Conser-vation	Sewer & Water	Public as a Percent of Total
1955	$11568	$2742	$4396	$799	$ 1238	22%
6	11637	2748	4443	896	1387	23
7	12313	2908	4753	1007	1399	25
8	13152	2897	5489	1017	1385	26
9	13614	2579	5992	1073	1403	25
1960	13631	2664	5758	1089	1380	27
1	14536	2813	6152	1255	1431	27
2	14828	2688	6447	1345	1549	27
3	16223	3035	6998	1445	1565	28
4	16969	3224	7003	1429	1878	29
1965	17856	3554	7108	1605	1956	28
6	18537	4199	7365	1676	1807	29
7	20169	4504	7269	1611	1709	33
8	19453	4272	7565	1406	2108	30
9	17827	3799	6886	1134	1695	28
1970	16576	3351	6736	1102	1535	28

Source: U.S. Bureau of the Census, Historical Statistics, Series N30-60.

APPENDIX TABLE V

FEDERAL EXPENDITURES FOR RIVERS AND HARBORS
1822-1970
(figures are annual averages in millions)

1822-25	$.02	1896-1900	$17.49
1826-30	.30	1901-05	19.89
1831-35	.61	1906-10	28.70
1836-40	.84	1911-15	41.94
1841-45	.22	1916-20	34.56
1846-50	.07	1921-25	55.99
1851-55	.47	1926-30	65.11
1856-60	.28	1931-35	101.84
1861-65	.14	1936-40	128.81
1866-70	2.40	1941-45	76.22
1871-75	5.57	1946-50	127.07
1876-80	6.11	1951-55	118.46
1881-85	10.67	1956-60	638.29
1886-70	8.39	1961-65	968.81
1891-95	15.98	1966-70	1,153.80

Source: U.S. Bureau of the Census, Historical Statistics of the U.S. Colonial Times to 1970, Bicentennial Edition (Washington, D.C., 1975), Series Q558.

APPENDIX TABLE VI

DISTRIBUTION OF GOVERNMENT GROSS CAPITAL FORMATION, CURRENT PRICES BETWEEN FEDERAL, STATE AND LOCAL 1869-1955

	State and Local, Including Federal Aid	Federal Aid	Direct Federal
	(percentage shares in total non-military)		
	(1)	(2)	(3)
1869-1878	82.3	0	17.7
1879-1888	87.0	0	13.0
1889-1898	83.2	0	16.8
1899-1908	83.5	0	16.5
1909-1918	89.5	0.3	10.5
1919-1928	95.2	4.6	4.8
1929-1938	81.1	23.8	18.9
1939-1948	53.7	14.7	46.3
1949-1955	77.2	6.6	22.8
1946-1955	77.1	7.2	22.9

Source: Simon Kuznets, Capital in the American Economy, Its Formation and Financing (Princeton University Press, 1961), table 24.

APPENDIX TABLE VII

SHARES OF FEDERAL AND OF STATE AND LOCAL GOVERNMENT
IN GOVERNMENT CONSTRUCTION 1915-1970
(millions of current dollars and percent)

Year	Total Public	Federal Ownership	State and Local Ownership		Federal Ownership Plus Grants as a Percent of Total Government Construction
			Total	Federal Grants[1]	
1915	$719	$11	--------- $648 ----------		---
1916	708	66	--------- 642 ----------		---
1917	1279	654	625	5	51.5%
1918	2238	1634	604	10	73.5
1919	1976	1162	814	65	62.1
1920	1352	232	1120	95	24.2
1921	1564	122	1442	78	12.8
1922	1684	100	1584	78	10.6
1923	1622	108	1514	77	11.4
1924	1901	111	1790	100	11.1
1925	2138	100	2038	89	8.8
1926	2144	92	2052	82	8.1
1927	2409	98	2311	81	7.4
1928	2485	122	2363	85	8.3
1929	2486	155	2331	80	9.5
1930	2858	209	2649	104	11.0
1931	2659	271	2388	235	19.0
1932	1862	333	1529	111	23.8
1933	1648	516	1132	286	48.7

APPENDIX TABLE VII--continued

Year	Total Public	Federal Ownership	State and Local Ownership		Federal Ownership Plus Grants as a Percent of Total Government Construction
			Total	Federal Grants[1]	
1934	$2211	$626	$1585	$721	60.9%
1935	2233	814	1419	567	61.8
1936	3516	797	2719	1566	67.2
1937	3096	776	2320	1117	61.1
1938	3420	717	2703	1320	59.6
1939	3809	759	3050	1377	56.1
1940	3628	1182	2446	946	58.7
1941	5751	3751	2000	697	77.3
1942	10660	9313	1347	475	91.8
1943	6322	5609	713	268	98.0
1944	3073	2505	568	126	85.6
1945	2398	1737	661	99	76.6
1946[2]	2362	870	1492	244	47.2
1946[3]	2231	865	1366	244	49.7
1947	3319	840	2479	409	37.6
1948	4704	1177	3527	417	33.9
1949	6269	1488	4781	461	31.1
1950	6866	1624	5242	454	30.3
1951	9255	2982	6274	464	37.2
1952	10779	4186	6594	550	43.9
1953	11242	4139	7103	700	43.0

APPENDIX TABLE VII--continued

Year	Total Public	Federal Ownership	State and Local Ownership[1] Total	Federal Grants	Federal Ownership Plus Grants as a Percent of Total Government Construction
1954	$11712	$3428	$8284	$675	35.0%
1955	11715	2769	8946	739	29.9
1956	12732	2726	10006	857	28.1
1957	14059	2974	11085	1269	30.2
1958	15457	3387	12070	2106	35.5
1959[4]	16070	3724	12346	2711	40.0
1960	15863	3622	12241	2267	37.1
1961	17148	3879	13269	2426	36.8
1962	17869	3913	13956	2556	32.6
1963	19357	4001	15356	3150	36.9
1964	20383	3898	16485	3489	36.2
1965	22062	4014	----------	18048	----------
1966	24007	3964	----------	20043	----------
1967	25536	3475	----------	22061	----------
1968	27605	3367	----------	24238	----------
1969	27963	3313	----------	24651	----------
1970	28096	3290	----------	24806	----------

[1]Construction programs receiving Federal grant-in-aid funds cover highways, schools, hospitals, airports and miscellaneous community facilities.

[2]Comparable with earlier years.

[3]Comparable with later years.

[4]First year which figures include Alaska and Hawaii.

Source: U.S. Bureau of the Census, Historical Statistics, Series N 66-69.

APPENDIX TABLE VIII

FINANCING STATE AND LOCAL CONSTRUCTION,
SELECTED YEARS, 1902-1958
(millions of current dollars and percent)

	State and Local Construction	Federal Aid	Increase or Decrease (-) in Debt	Percent Federal Aid	Percent Debt Financed	Debt as a Percent of Income[a]
1902	$164	$ 7	----	4%	----	202%
1913	442	12	----	3	----	219
1922	1584	78	$1446	5	91%	200
1927	2311	81	1074	4	46	193
1932	1529	111	232	7	15	251
1934	1585	751	-659	47	-42	255
1936	2719	1566	297	58	11	231
1938	2703	1320	-26	49	- 1	189
1940	2446	946	220	39	09	188
1942	1347	475	-570	35	-42	157
1944	568	126	-1294	22	-28	130
1946	1492	244	-754	16	-51	105
1948	3527	417	1841	12	52	94
1950	5242	454	3116	9	59	104
1952	6594	550	1984	8	30	106
1954	8284	675	3682	8	44	120
1956	10006	857	5149	9	51	127
1958	12070	2106	5148	17	43	131
Average 1922-1932	1808	90	435	5	24	215

APPENDIX TABLE VIII--continued

	State and Local Construction	Federal Aid	Increase or Decrease (-) in Debt	Percent Federal Aid	Percent Debt Financed	Debt as a Percent of Income[a]
Average 1934-1940	$2363	$1146	$-168	48%	- 7	216%
Average 1948-1958	7621	843	3487	11	33	114

Source: Columns one and two for 1902 and 1913, U.S. Bureau of the Census, Historical Statistics, Series Y 654 and 674; for 1922 on, Series N 68 and 69. Columns three and five compiled from Series Y 655, 680 and 681.

[a]Income is revenue from state and local sources.

NOTES

1. Quoted in Leo Marx, The Machine in the Garden (New York: Oxford, 1967), p. 41.

2. For a discussion of the economic philosophies of early American statesmen see Joseph Dorfman, The Economic Mind in American Civilization 1606-1865 (New York: Viking, 1946), vol. I, ch. 18.

3. The phrase "constructive liberalism" is from Milton Heath, Constructive Liberalism. The Role of the State in Economic Development in Georgia to 1860 (Cambridge: Harvard Univ. Press, 1954). That the purpose of state activity was to "release private energies" is argued in James Hurst, Law and the Conditions of Freedom (Madison: Univ. of Wisconsin Press, 1956).

4. Albert Gallatin, "Report on Roads and Canals," American State Papers, Miscellaneous, I, 725.

5. That it was sectional rivalries that prevented the Federal government from playing a larger role in the internal improvements movement is the judgment of Carter Goodrich in his Government Promotion of American Canals and Railroads, 1800-1890 (New York: Columbia Univ. Press, 1960). See especially ch. 2.

6. The data on Federal activities are taken from Goodrich, Government Promotion; Forest G. Hill, Roads, Rails, and Waterways (Norman: Univ. of Oklahoma Press, 1957), and Mark Aldrich, Rates of Return on Investment in Technical Education in the Ante-Bellum American Economy (New York: Arno, 1974).

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8. On the role of the Federal government in Western road-building see W. Terrentine Jackson, Wagon Roads West (New Haven: Yale Univ. Press, 1965) and Ellis L. Armstrong, ed., History of Public Works in the United States 1776-1976 (New York: American Public Works Association, 1976), ch. 2.

9. Carter Goodrich, Government Promotion, ch. 2.

10. Henry Broude, "The Role of the State in American Economic Development, 1820-1890," in Hugh Aitken, ed., The State and Economic Growth (New York: Social Science Research Council, 1959), pp. 1-25.

11. For evidence that the states thought of their scientific surveys as internal improvements see Walter B. Hendrickson, "Nineteenth-Century State Geological Surveys: Early Government Support of Science," in Nathan Reingold, ed., Science in America Since 1820 (New York: Science History Publications, 1976), pp. 131-145.

12. The quotations are from Goodrich, Government Promotion, 9.

13. A number of modern writers emphasize the non-economic benefits which contemporaries thought would stem from government promotion of economic development. See especially Heath, Constructive Liberalism, ch. 1; Harry Scheiber, Ohio Canal Era (Athens: Univ. of Ohio Press, 1969), ch. 4; Robert Parks, Democracy's Railroads (Port Washington: Kennikat, 1972), ch. 1; and Louis Hartz, Economic Policy and Democratic Thought (Cambridge: Harvard Univ. Press, 1948), ch. 7.

14. Quoted in Parks, Democracy's Railroads, p. 39.

15. The remainder of this section is drawn heavily from Goodrich, Government Promotion; Carter Goodrich, ed., Canals and American Economic Development (Port Washington: Kennikat, 1972); Scheiber, Ohio Canal Era; Parks, Democracy's Railroads; Hartz, Economic Policy; Heath, Constructive Liberalism; Hill, Roads, Rails, and Waterways; Oscar and Mary Handlin, Commonwealth (New York: New York Univ. Press, 1947); Ronald Shaw, Erie Water West (Lexington: Univ. of Kentucky Press, 1967), and George Rogers Taylor, The Transportation Revolution, 1815-1860 (New York: Harper Torchbooks, 1968).

16. This paragraph is based on Heath, Constructive Liberalism. The block quotation is from p. 266.

17. This section relies heavily on Goodrich, Government Promotion, chs. 5-7.

18. These data are from Goodrich, Government Promotion, ch. 8, and Harvey Segal, "Cycles of Canal Construction," in Goodrich, ed., Canals and American Economic Development, pp. 169-215.

19. Segal, "Cycles," 180.

20. W. Kaye Lambe, History of the Canadian Pacific Railway (New York: Macmillan, 1977), ch. 15.

21. Scheiber, Ohio Canal Era, ch. 4.

22. Taylor, Transportation Revolution, pp. 141-142.

23. This interpretation of the growth of American cities is from Sam Bass Warner, The Private City: Philadelphia in Three Periods of its Growth (Philadelphia: Univ. of Pennsylvania Press, 1968), esp. pp. ix-xi.

24. This and the following two paragraphs are based on Edgar W. Martin, The Standard of Living in 1860 (Chicago: Univ. of Chicago Press, 1942), chs. 8-9; the quotation is on p. 268.

25. Edgar W. Knight, Education in the United States (Boston: Ginn and Co., 1929), p. 249.

26. Martin, Standard of Living, pp. 298-299.

27. Samuel Bowles and Herbert Gintis, Schooling in Capitalist America (New York: Basic Books, 1976).

28. Bowles and Gintis, Schooling, p. 169.

29. Bowles and Gintis, Schooling, p. 169.

30. Bowles and Gintis, Schooling, p. 162.

31. The following section on the origin of Philadelphia's municipal water supply system is based on Nelson Blake, Water for the Cities (Syracuse: Syracuse Univ. Press, 1956), chs. 1-5, and on Warner, The Private City, ch. 6. The quotation is from Blake, Water for the Cities, p. 8.

32. This paragraph is based on Blake, Water for the Cities, chs. 7-13; Armstrong, ed., History of Public Works, ch. 8; Charles King, A Memoir of the Construction, Cost, and Capacity of the Croton Aquaduct (New York: Charles King, 1843); Martin, Standard of Living, ch. 8, and on Chicago Department of Public Works, Chicago, A History (Chicago: Department of Public Works, 1973).

33. Munn v. Illinois, 94 U.S. 113 (1877).

34. The material on the Panama Canal is based on David McCullough, The Path Between the Seas (New York: Simon and Schuster, 1977).

35. A summary of early criticisms of Bureau activities is contained in Warren M. Persons, Government Experimentation in Business (New York: John Wiley, 1934), ch. 5.

36. See Bowles and Gintis, Schooling, ch. 7.

37. On the quest for adequate water supplies in Chicago and New York, see the sources cited in note 31 above.

38. For impure water as a public health problem see Charles E. Winslow, Man and Epidemics (Princeton: Princeton Univ. Press, 1952); George Rosen, A History of Public Health (New York: M. D. Publications, 1958), and Mazyck Ravenel, ed., A Half Century of Public Health (New York: American Public Health Association, 1921). The judgment that early water supplies actually worsened public health is Winslow's; see p. 40.

39. Quoted in Winslow, Man and Epidemics, p. 12.

40. Constance Green, "Establishing Manufacturing Cities," in Allen Wakstein, ed., The Urbanization of America (Boston: Houghton Mifflin, 1970), pp. 188-202; the quotation is from pp. 193-194.

41. Edward Meeker, "The Social Rate of Return on Investment in Public Health," Journal of Economic History 34 (June, 1974), 392-419. See pp. 417-419.

42. The early history of urban transportation is admirably summarized in George Rogers Taylor, "Building an Intra-Urban Transportation System," in Wakstein, Urbanization, pp. 128-50.

43. The story of New York's construction of the subway is told in James Walker, Fifty Years of Rapid Transit (New York: arno, 1970). For information on Boston's subways see Charles Huse, The Financial History of Boston (Cambridge: Harvard Univ. Press, 1916), ch. 6.

44. The survey mentioned in the text is described in Armstrong, ed., History of Public Works, p. 68. The Census data are in U.S. Bureau of the Census, Financial Statistics of Cities: 1909 (Washington: U.S. Government Printing Office, 1913), Table 11.

45. On the Brooklyn Bridge see David McCullough, The Great Bridge (New York: Simon and Schuster, 1972).

46. The following three paragraphs are based on Edward Bemis, ed., Municipal Monopolies (New York: Thomas Y. Crowell, 1899); U.S. Bureau of the Census, Central Electric Light and Power Stations: 1902 (Washington: U.S. Government Printing Office, 1905), and Carl D. Thompson, Public Ownership (New York: Thomas Y. Crowell, 1925).

47. This paragraph is based on Armstrong, ed., History of Public Works, ch. 3.

48. Lance Davis et al., American Economic Growth (New York: Harper and Row, 1972), ch. 13.

49. For a description of early efforts to use public works as a cure for unemployment see Arthur D. Gayer, Public Works in Prosperity and Depression (New York: National Bureau of Economic Research, 1935). Also see Herbert Gutman, "The Failure of the Movement by the Unemployed for Public Works in 1873," Political Science Quarterly 80 (June, 1965), 254-276.

50. John Kenneth Galbraith, The Economic Effects of the Federal Public Works Expenditures, 1933-1938 (Washington: National Resources Planning Board, 1940), p. 16.

51. Galbraith, Economic Effects of the Federal Public Works, p. 23.

52. Data on the early history of the Corps are from Robert Haveman, Water Resource Investment and the Public Interest (Nashville: Vanderbilt Univ. Press, 1965), ch. 1. The figure of $100 million for Bureau of Reclamation construction is arrived at by summing the figures in Table VI above.

53. Haveman, Water Resource Investment, ch. 1.

54. This estimate is from E. Cary Brown, "Fiscal Policy in the Thirties: A Reappraisal," American Economic Review 46 (December, 1956), 857-879.

55. For a description of some of these projects see U.S. Public Works Administration, America Builds (Washington: U.S. Government Printing Office, 1939).

56. U.S. Public Works Administration, America Builds, ch. 12.

57. Harvey S. Perloff et al., Regions Resources and Economic Growth (Lincoln: Univ. of Nebraska Press, 1965), p. 452.

58. Calvin B. Hoover and B. U. Ratchford, The Impact of Federal Policies on the Economy of the South (Washington: National Planning Association, 1949), p. 123.

59. The argument in this paragraph is based on Arnold Toynbee, The Industrial Revolution (Boston: Beacon, 1962); Richard H. Tawney, Religion and the Rise of Capitalism (New York: Harcourt Brace, 1926); and Karl Polanyi, The Great Transformation (New York: Farrar and Reinhart, 1944).

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61. The figures are from U.S. Congress, Senate, Report of the Smaller War Plants Corporation, Economic Concentration and World War II, 79th Cong., 2d Sess., Sen. Doc. 206 (Washington: U.S. Government Printing Office, 1946), ch. 3 and esp. Appendix Table D-1.

62. These data on Corps expenditures are from Haveman, Water Resource Investment, ch. 1.

63. The conclusion that the impact of the automobile was probably greater in the 1920s than in the 1950s and 1960s is that of Lance Davis et al., American Economic Growth (New York: Harper and Row, 1972), pp. 538-539.

64. U.S. Congress, Joint Economic Committee, The Economics of Federal Subsidy Programs, 92d Cong., 1st Sess. (Washington: U.S. Government Printing Office, 1972), 4.

APPENDIX G: FEDERAL AGENCY METHODS FOR DETERMINING PUBLIC WORKS INVESTMENT NEED

TABLE OF CONTENTS

		Page
LIST OF EXHIBITS		G.iv
1.0	INTRODUCTION AND SUMMARY OF FINDINGS	G.1
1.1	Introduction	G.1
1.2	Summary of Findings	G.2
2.0	THE FEDERAL PERSPECTIVE FOR PUBLIC WORKS INVESTMENT	G.11
2.1	Introduction	G.11
2.2	A Variety of Rationales or "Need" Assessments for PWI	G.11
2.2.1	Promotion of Commerce	G.12
2.2.2	Encouraging Economic Development	G.12
2.2.3	Protecting Citizenry: Defense	G.12
2.2.4	Protecting Citizenry: Public Health	G.13
2.2.5	Countercyclical Measures	G.13
2.2.6	Improving the Quality of Life	G.14
2.2.7	Equity Considerations, Protection of Civil Rights/Property	G.14
2.2.8	Concluding Remarks on the Underlying Concepts for Needs Rationale	G.14
2.3	Measurement of Aggregate "Needs"	G.15
2.4	The Role of the Federal Government In Meeting These Needs	G.16
2.5	Federal Determination of Relative Need: Time, Place, Type, and Targeted Population	G.17
2.6	The Expenditure of Resources	G.18
3.0	SELECTION AND REVIEW OF FEDERAL PWI PROGRAMS	G.19
3.1	Introduction	G.19
3.2	Selection of Federal PWI Programs for Review	G.19
3.3	The Program by Program Review Process	G.23
4.0	HIGHLIGHTS OF SELECTED FEDERAL PWI PROGRAMS	G.25
4.1	Introduction	G.25
4.2	Conceptual Basis for PWI Programs	G.25
4.3	Funding Mechanisms	G.30

TABLE OF CONTENTS (continued)

		Page
4.4	Needs Assessment and Measurement Characteristics for PWI Programs	G.31
4.4.1	Topics for Reviewing Needs Assessment and Measurement Procedures	G.32
4.4.2	Economic Development Programs	G.37
4.4.3	Health and Education Programs	G.40
4.4.4	Law Enforcement Programs	G.42
4.4.5	Transportation Programs	G.45
4.4.6	Water Supply and Wastewater Treatment Programs	G.46
4.4.7	Watershed-Flood Prevention Programs	G.47
ADDENDUM A:	PROGRAM SUMMARIES	G.51
ADDENDUM B:	1975 ACIR SURVEY OF FEDERAL ADMINISTRATORS OF GRANT PROGRAMS	G.225

LIST OF EXHIBITS

Exhibit Number		Page
1.1	Conceptual Categories of Need Satisfied By Various Federal PWI Programs	G.3
1.2	Selected Characteristics of Federal PWI Programs	G.6
3.1	Federal PWI Programs for Focusing the Needs Assessment Methodology Review	G.21
4.1	Conceptual Categories of Need Satisfied by Various Federal PWI Programs	G.28

1.0 INTRODUCTION AND SUMMARY OF FINDINGS

1.1 Introduction

In the post-World War II years, the Federal government has made distinctive contributions to the shifting patterns of public works investment (PWI). The rapid growth of urban and metropolitan centers raised problems that attracted Federal concern and action. Thus, as state and local spending substantially increased to pay for expanding public services in transportation, health, housing, recreation and education, states and localities were increasingly aided by Federal funds, guidance, and initiative.

One consequence of this adjustment was a wider public acceptance of an expanding role for the Federal government, whereby a growing portion of state and local spending on perceived "needs" was being supported by the Federal government. Moreover, this increased dependence on Federal aid may have affected the determination of state and local priorities based on the availability of grants-in-aid.[1] Hence, a structural change of great significance emerged with the post-World War II growth of Federal aid for public works expenditures and the resultant increase in Federal-state, as well as direct Federal-local relations.

Hence, the overall scope of this study included, among its objectives, that of improving the understanding of the (alternative) methods used by various Federal agencies both to determine the "need" for PWI and also to allocate Federal funds to states and localities for PWI. Within this scope was included the underlying "rationale" of these various approaches, as well as the extent to which state and local governments can influence the determination of "need" for, and the allocation and expenditure of, Federal funds. No attempt was made to estimate current or future "needs" in any particular program area, nor were program areas prioritized in terms of relative "need". While important research topics, these were well beyond the scope of the current study. Consequently, the focus here was on delineating those factors that have been considered important in defining needs. Such an understanding is intended to assist interested parties to specify feasible and desirable approaches to needs assessment and measurement.

To achieve these objectives, the needs assessment methodologies of 17 Federal PWI programs were systematically reviewed. These 17 programs

[1] See Volume I, Chapter 5.0, of this study.

were selected so that they cut across all PWI functional categories as well as all Federal agencies called for in the study as initially structured by the Department of Commerce. Moreover, these programs are representative of the major construction and renovation type programs funded by the Federal government -- either directly or through grants-in-aid and loans to states and localities -- since World War II.[1] Each of the 17 programs was systematically reviewed through the use of literature surveys and access to previously unpublished material, collected through a survey of Federal agencies.

In this appendix, the results of reviewing Federal PWI assistance programs are presented.[2] Following the major findings (presented in Section 1.2), a more detailed review is provided. First, Chapter 2.0 gives a perspective for the Federal role in providing for PWI. Chapter 3.0 continues with a description of how this task was performed, in other words, how the 17 programs were selected and reviewed. Chapter 4.0 then discusses various characteristics related to needs assessment and measurement and state-local influence for the 17 programs reviewed.

1.2 Summary of Findings

The principal findings that emerged from the review of Federal agency methods for determining PWI needs are:

- It was discovered that a variety of categories could be proposed as underlying "themes" for each of these Federal PWI programs (see Exhibit 1.1).

Improvement of the quality of life is an underlying theme of many of the programs, particularly those programs related to water supply-wastewater treatment, health and education and watershed-flood prevention. Promotion of commerce is satisfied by the transportation related programs, while encouraging economic development is the primary concern of the EDA economic development grants, the Community Development Block Grant (CDBG) program and the Bureau of Reclamation program. In addition, many programs have equity considerations and the protection of civil rights and property as their underlying premise, particularly the law enforcement programs.

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[1] Maintenance and operation programs were not specifically reviewed. However, few Federal programs specifically earmarked for PWI will fund maintenance and operation expenditures (see Volumes II and III of this study).

[2] Other aspects of the role of Federal grants, including their substitutive or stimulative impact on aggregate state and local spending, are discussed in Volume I, Chapter 4.0, of this study. A similar analysis of the role of Federal grants in financing public works investment in a sample of urban areas is discussed in Volume II of this study.

Exhibit 1.1: Conceptual Categories of Need Satisfied By Various Federal PWI Programs

Program Name or Description and Federal Agency Administering Program	Conceptual Categories of "Need"						
	Promotion of Commerce	Encourage Economic Development	Protect Citizenry - Defense	Protect Citizenry - Health	Countercyclical Measures	Improve Quality of Life	Equity/Protect Rights and Property
Economic Development Programs							
• Rural Community Facilities Program/ Farmers Home Administration, USDA		S				S	P
• Economic Development Grants/Economic Development Administration, Department of Commerce		P			S		
• Community Development Block Grants and Loans (and predecessor categorical programs)/Department of Housing and Urban Development		P				S	
Health and Education Programs							
• Financial Assistance for School Construction in Federally Affected Areas/Office of Education, Department of Health, Education and Welfare		P				S	
• Construction, Reconstruction and Renovation of Academic Facilities/Office of Education/ Department of Health, Education and Welfare						S	P
• Hill Burton Hospital (and other health facilities) Construction and Renovation Program/ Health Resources Administration, Department of Health, Education and Welfare				P		S	S
Law Enforcement Programs							
• Federal Prison Construction/Bureau of Prisons, Department of Justice			S			S	P
• Law Enforcement Assistance to State and Localities for Strengthening Law Enforcement and Criminal Justice/Law Enforcement Assistance Administration, Department of Justice			S			S	P

P = Primary conceptual category of need satisfied by PWI program.
S = Secondary conceptual categories of need satisfied by PWI program.

Exhibit 1.1: Conceptual Categories of Need Satisfied by Various Federal PWI Programs (continued)

Program Name or Description and Federal Agency Administering Program	Conceptual Categories of "Need"						
	Promotion of Commerce	Encourage Economic Development	Protect Citizenry - Defense	Protect Citizenry - Health	Countercyclical Measures	Improve Quality of Life	Equity/Protect Rights and Property
Transportation Programs							
• Airport Development Aid Program/Office of Airports, Federal Aviation Administration, Department of Transportation	P		S				
• Federal Aid Highway Program/Federal Highway Administration, Department of Transportation	P		S				
• Railroad Rehabilitation and Improvement Loan Program/Federal Railroad Administration, Department of Transportation	P	S	S				
• UMTA Capital Improvement Grants and Loans (Formula and Project)/Urban Mass Transit Administration, Department of Transportation	S					P	S
Water Supply - Wastewater Treatment Programs							
• Water and Waste Disposal Systems for Rural Communities/Farmers Home Administration, Department of Agriculture		S		P		S	
• Construction Grants for Wastewater Treatment Works/Environmental Protection Agency				S		P	
Watershed - Flood Prevention Programs							
• Watershed Protection and Flood Prevention/ Soil Conservation Service/Department of Agriculture		S				S	P
• Flood Control, Navigation and Multiple Purpose Projects with Power Facilities/Army Corps of Engineers, Department of Defense	P					S	S
• Irrigation and Multiple Purpose Projects with Power Facilities/Bureau of Reclamation, Department of the Interior		P				S	

P = Primary conceptual category of need satisfied by PWI program.
S = Secondary conceptual category of need satisfied by PWI program.

- Federal PWI programs can be distinguished by the type of grant and/or loan utilized, i.e., categorical or block, and the primary method of distribution -- formula, discretionary or direct expenditure (Exhibit 1.2); moreover, such characteristics influence the degree of state and local participation in the project selection process.

Until the mid 1960's, almost all Federal assistance (i.e., grants and loans) had been in the form of categorical grants-in-aid by which the Federal government provided funds and, along with state or local governments, administered programs bearing both a strong national and state or local interest. This type of grant is authorized primarily to stimulate states and localities to take remedial action in an innovative and new way. Usually they are directed at rather narrow objectives or specifically defined needs. Highly prescriptive guidelines and regulations must be followed during application for and then administration of these grants-in-aid projects. These narrowly defined categorical grant programs did, often times, result in problems for prospective recipients. Frequently, a particular program was too restrictive to meet a "need" completely, forcing a grantee to attempt to combine several assistance programs, each with its own set of requirements, to achieve its goals. Even when programs were combined, grantees often had difficulty developing a project that was comprehensive and flexible enough to meet overall "needs".

Since the mid 1960's, block grants have been utilized in an effort to decentralize intergovernmental functional responsibilities. Although similar to categorical grants, in that funds are awarded for specified purposes on the basis of an application (or plan) setting forth the intended use of funds, block grants differ from categorical grants in that they are for more broadly defined purposes. Moreover, with block grants, recipients normally have more influence in project selection since they usually play a major role in planning, policy and program development, and administration. Thus, to the extent that block grant programs hold true to the established concept, they will, by definition, assign a major role to state and local agencies in the planning and execution of PWI projects.

With the Partnership for Health Act (1966), block grants were used for the first time.[1] Two years later, when the Law Enforcement Assistance Administration (LEAA) was created, block grants again were utilized because Congress believed law enforcement was best handled locally;

[1]This block grant program, however, was not "public investment" in nature.

Exhibit 1.2: Selected Characteristics of Federal PWI Programs[1]

Program Name or Description and Federal Agency Administering Program	Type of Grant/ Loan		Primary Method of Distribution				Type of Variables Used in Formula or Discretionary Allocations													Primary Recipient			Applications/ Funds To Localities Channel Through The State		Planning Funds Available To Recipients	
							Need							Capability		Effort										
	Categorical	Block	Formula	Discretionary	Direct Federal Expenditure		Land Area	Population	Poverty	Housing	Capital Requirement	Condition of Capital Stock		Per Capita Income	Ability to Obtain Credit	Unemployment	High Recipient Tax Effort	Low Recipient Match Required	No Match Required	State	Locality	Both	Yes	No	Yes	No
Economic Development Programs																										
• Rural Community Facilities Program/ Farmers Home Administration, USDA	x		x					x							x		x				x			x		x	
• Economic Development Grants/Economic Development Administration, Department of Commerce	x			x				x	x					x		x		x			x		x			x	
• Community Development Block Grants and Loans (and predecessor categorical programs)/Department of Housing and Urban Development		x	x					x	x	x							x				x		x			x	
Health and Education Programs																										
• Financial Assistance for School Construction in Federally Affected Areas/Office of Education, Department of Health, Education and Welfare	x			x				x											x		x					x
• Construction, Reconstruction and Renovation of Academic Facilities/Office of Education/ Department of Health, Education and Welfare	x		x					x				x		x	x			x				x		x			
• Hill Burton Hospital (and other health facilities) Construction and Renovation Program/ Health Resources Administration, Department of Health, Education and Welfare	x		x					x				x		x				x				x		x			
Law Enforcement Programs																										
• Federal Prison Construction/Bureau of Prisons, Department of Justice	--	--				x		x				x				--	--	--	--	x			--	--	--	--
• Law Enforcement Assistance to State and Localities for Strengthening Law Enforcement and Criminal Justice/Law Enforcement Assistance Administration, Department of Justice		x	x					x								x						x	x		x	

-- = Not Applicable

[1]This table describes in a general manner key characteristics of the programs as they existed during the 1957-1977 period. Exceptions to the general rules are not covered.

Exhibit 1.2: Selected Characteristics of Federal PWI Programs[1] (continued)

Program Name or Description and Federal Agency Administering Program	Type of Grant/ Loan		Primary Method of Distribution			Type of Variables Used in Formula or Discretionary Allocations													Primary Recipient			Applications/ Funds to Localities Channel Through the State		Planning Funds Available To Recipients	
						Need							Capability		Effort										
	Categorical	Block	Formula	Discretionary	Direct Federal Expenditure	Land Area	Population	Poverty	Housing	Capital Requirement	Condition of Capital Stock	Per Capita Income	Ability to Obtain Credit	Unemployment	High Recipient Match Required	Low Recipient Match Required	No Match Required	State	Locality	Both	Yes	No	Yes	No
Transportation Programs																									
• Airport Development Aid Program/Office of Airports, Federal Aviation Administration, Department of Transportation	x		x			x	x									x			x			x	x		
• Federal Aid Highway Program/Federal Highway Administration, Department of Transportation	x		x			x	x									x		x			--	--		x
• Railroad Rehabilitation and Improvement Loan Program/Federal Railroad Administration, Department of Transportation	x			x			x				x		x			x			x			x		
• UMTA Capital Improvement Grants and Loans (Formula and Project)/Urban Mass Transit Administration, Department of Transportation	x			x			x				x					x			x			x		
Water Supply - Wastewater Treatment Programs																									
• Water and Waste Disposal Systems for Rural Communities/Farmers Home Administration, Department of Agriculture	x		x				x					x			x				x			x		
• Construction Grants for Wastewater Treatment Works/Environmental Protection Agency	x		x							x						x			x			x		
Watershed - Flood Prevention Programs																									
• Watershed Protection and Flood Prevention/ Soil Conservation Service/Department of Agriculture	x			x		x	x									x			x			x		
• Flood Control, Navigation and Multiple Purpose Projects with Power Facilities/Army Corps of Engineers, Department of Defense	--	--			x	x	x								--	--	--		x		--	--	--	--
• Irrigation and Multiple Purpose Projects with Power Facilities/Bureau of Reclamation, Department of the Interior	--	--			x	x	x								--	--	--		x		--	--	--	--

-- = Not Applicable

[1] This table describes in a general manner key characteristics of the programs as they existed during the 1957-1977 period. Exceptions to the general rules are not covered.

furthermore, this mechanism provided more discretion to states and localities in solving particular localized problems. With the initiation of the Federal revenue sharing program in the early 1970's and with the enactment of legislation in 1974 consolidating certain HUD categorical programs into a broader purpose program (the Community Development Block Grant (CDBG) program), block grant programs continued to grow for PWI-related activities.

With respect to the method of distributing funds to recipients, approximately one-half of the programs reviewed allocate Federal funds among eligible recipients on the basis of a formula, which is, often times, prescribed in the authorizing legislation or rules and regulations. As illustrated in Exhibit 1.2, factors included in the formulae can be viewed as surrogate measures of need, capability and effort. Population -- either total or some type of subgroup -- is one measure of need used by all the programs reviewed. Condition of the capital stock and land area are also sometimes used. Measures of recipient capability are not as widely used in the formulae; however, per capita income is the usual surrogate measure when used. Recipient effort is incorporated via matching requirements, and all aid programs (except assistance for school construction in Federally affected areas) require recipient matching. Usually the required match is low (under 25 percent). However, some programs -- LEAA, for example -- require a 50 percent (or greater) match, and other programs -- Hill-Burton, for example -- have a sliding scale for the required match.

In contrast, discretionary grants require prospective grantees to submit specific project proposals to Federal agencies, which, in turn, review and select proposals based on agency priorities. Measures of recipient need, capability and effort are also considered by the various Federal agencies in awarding funds. Discretionary grants provide the Federal government with a greater amount of influence -- compared to formula based grants -- in determining which "needs" are the most important.

In addition, Congress itself also authorizes and appropriates funds directly for the construction of some major public facilities. The Army Corps of Engineers, the Bureau of Prisons, and the Bureau of Reclamation, for example, submit their project-by-project construction plans to Congress for approval.

- Because of the crude proxies used by Federal agencies for measures of recipient need, capability and effort and because timely data is not always available to quantify such measures, the actual allocation of Federal aid for a particular PWI program may not always direct assistance to areas currently most in need according to the direct, as opposed to the proxy, standards.

Population data -- widely used as a needs factor in distributing funds -- suffer from problems of currency and accuracy. Although the Census Bureau provides annual estimates of total population for each state, these are not made for many population subcategories. Thus, some formulae may rely on population estimates of subcategories that are quite old.

Moreover, some Census concepts designed for statistical purposes are weak when related to needs formula allocation purposes. For example, the Census Bureau defines "urban" to include communities with 2,500 population and over, whereas a Standard Metropolitan Statistical Area (SMSA) is defined as one or more interrelated counties containing a central city of at least 50,000 population. These two indicators not only differ dramatically when considering the servicing of needs in urban communities of different size, but also in the context of a state's level of urbanization.

With respect to capability measures, the present widespread practice of using a state's or locality's per capita income as a measure of fiscal capability may be inappropriate because it represents the economic well-being of individuals, rather than financial resources of their governments. The income of resident citizens is only one of the bases on which taxes are imposed. Among the most significant kinds of revenue sources accounting only indirectly for personal income are state corporate taxes, severance taxes, local property taxes, surpluses from public utilities, and motor fuel taxes. This suggests that jurisdictions that are needy in particular service areas are not necessarily needy financially. Thus, careful consideration must be given to the objectives of the allocation formula before choosing a summary capability statistic for use in the formula.

Finally, evidence suggests that effort-based grants can disproportionately benefit the wealthier and poorer states. Because the wealthier states have a higher taxable (and taxed) per capita income and likely relatively stronger economic base, they can more easily afford to make expenditures in program areas where Federal matching grants are available. On the other hand, poorer states (when compared to middle income or wealthier states) are,oftentimes, able to receive more Federal dollars per state dollar spent.

- Although eligibility requirements and procedures for receiving funds vary across programs, all aid programs require the recipient to submit a state plan (if states are the recipients) or an application documenting need for a particular project (or groups of projects) based upon widely recognized and approved standards for the given functional area. Such plans can usually be prepared with the assistance of planning funds from the Federal government.

Most Federally assisted planning accompanying the receipt of Federal PWI funds takes the form of functional planning, which focuses on a program, subject matter or functional area. Within any given agency, comprehensive planning, which focuses on a geographic area across several or all functional areas, is quite rare (although the EDA program and the USDA rural facilities program provide counter-examples). Moreover, few legislative acts permit state and local recipients to spend Federal program dollars on other than the specific functional area, a notable exception being the highway program, which allows the funds to be used for mass transit as well.

However, planning funds have been made available for most of the programs reviewed (exceptions include the two education programs received and the highway program). In such instances, state and local participation in selecting projects to receive Federal funds is heightened.

2.0 THE FEDERAL PERSPECTIVE FOR PUBLIC WORKS INVESTMENT

2.1 Introduction

Historically, the Federal government has taken an active role in public works investment. To better understand how this role (which has evolved over time) has achieved its current status and, to provide a foundation for the topics dealt with in the remainder of this appendix, this chapter discusses the following topics:

- Rationale advanced for "need" for PWI;
- Measurement of aggregate "needs";
- The role or commitment that the Federal government plays in meeting these needs;
- Ways in which the Federal government determines relative need and priorities among recipients of Federal aid; and
- The expenditure of resources to meet PWI "needs".

2.2 A Variety of Rationales or "Need" Assessments for PWI

Initially, it is useful to briefly recapitulate a number of reasons which have been advanced, historically and currently, as supporting arguments for PWI provision by the Federal government -- i.e., why there is a "need" for PWI. An inventory of these conceptual categories of needs, with a minimum of overlap, is as follows:

- Promotion of commerce;
- Encouraging economic development;
- Protection of citizenry: defense;
- Protection of citizenry: public health;
- Countercyclical measures;
- Improvements in the quality of life;

- Equity considerations/protections/protection of civil rights and property; and
- The public interest.

Each of these is discussed below.

2.2.1 Promotion of Commerce

As long ago as Hamilton's publication of the Report on Manufactures,[1] it has been accepted that promoting commerce (foreign, interstate, intrastate) is one of the duties of government. Capital outlay requirements for some projects (e.g., canals) were deemed by the founding fathers to exceed the private sector's ability to invest in these activities. Government assumed the responsibility of underwriting a large portion or, in some cases, all of the capital requirements. Similarly, today, provision of most highways is considered to be the public sector's responsibility -- the objective being to promote intra- or interstate commerce. Another example is the Army Corps of Engineers' construction, operation and maintenance of the inland riverway system with its locks and dams.

2.2.2 Encouraging Economic Development

Public investments, either singly or in conjunction with the private sector, are by no means a recent phenomenon. Indeed, such public investments can trace their roots back to the road construction projects in the 1970's. The objective of these investments was to stimulate development by providing infrastructure that could not profitably be provided by the private sector, an objective beyond that of merely accommodating the flow of commerce. During the depressed 1930's, public investments for this purpose became widespread again, one of the most illustrious cases being that of the Tennessee Valley Authority (TVA). The encouragement of economic development expanded into a wide range of activities so that, by today, structurally and cyclically depressed industries as well as regions look -- at least, partially -- to government to foster their economic growth and development. Several PWI functional activities (e.g., transportation and railroad industry, water supply and treatment facilities, other public utilities) and projects are funded with the economic development objective, among others, in mind.

2.2.3 Protecting Citizenry: Defense

Another objective of PWI is to defend the citizens of the nation. One of the few relatively undisputed areas of government activity, investment for defense includes not only protection from outside aggressors,

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[1] Hamilton, Alexander, Report on Manufactures, Communication to the House of Representatives, December 5, 1791, Senate Document 172 (63rd Congress, First Session).

but also "defense" in the form of police protection, the corrections system, and other forms of defense of civilians against unlawful and unauthorized activity.

It should be noted that many PWI programs are rationalized, utilizing the "protection of citizenry" argument -- often beyond the conventional definitions of defense. For example, the Interstate Highway System which can be viewed as a major promoter of commerce, has also been advanced as a mechanism of defense, e.g., to evacuate people from areas that might be invaded (or, more currently, as a civil defense requirement). Moreover, PWI in buildings, equipment and vehicles for public protection, military or civil defense purposes also fall under this category.

2.2.4 Protecting Citizenry: Public Health

Potable water supplied in the early to mid 1800's was provided through public agencies to safeguard the health of people. Later, protection via polio vaccines and other preventive medicine was carried out, assisted by government, so that all citizens could be immunized regardless of income and place of residence. Here, the type of "investment" assumes many forms, including research and development. And, publically supported health facilities are in every urbanized and many rural areas of the nation. Indeed, this is a generally agreed upon function of the government.

2.2.5 Countercyclical Measures

This concept has become increasingly important, especially since the depressed 1930's. The basic idea, here, is to increase government spending -- during periods when there is a considerable shortfall in attaining the nation's economic potential -- to both maintain employment and stimulate demand for goods and services so that the impact of recessions is mitigated. The Civilian Conservation Corporation, the Public Works Administration, the Works Progress Administration and dozens of other agencies were created during the 1930's to achieve such objectives.

The concept of national-level demand stimulation has gone beyond that of treating economic cycles. Such activities are also intended to perform subnational, e.g., regional (multi-state or multi-county) anti-stagnation roles as well. That is, pockets of poverty (regionally or in an urban context) have been provided with substantial resources -- often to be used to construct PWI in these areas -- in an attempt to stimulate the local economy.

Much of countercyclical PWI has, as one of its main concerns, the alleviation of unemployment and is therefore of a labor-intensive variety. The objective of PWI programs of this nature -- and the timing of their application -- is to retard recessions but to refrain from overheating the expansionary phases of the cycle.

2.2.6 Improving the Quality of Life

Many recent activities of government have been undertaken to improve the quality of life. For example, the primary objective of much of the recent legislation to curb air and water pollution has been, ultimately, to improve the environment and living conditions of Americans. City and national parks and recreational activities provided by governmental PWI also serve to improve living standards, from a recreational perspective.

Improving the quality of life, notwithstanding a considerable division of opinion about its scope, has become an important PWI objective.

2.2.7 Equity Considerations, Protection of Civil Rights/Property

Protecting the rights of the citizenry has always been a major public concern. Protection under the law is guaranteed by the Constitution and the Bill of Rights. This protection consists of not only the right to vote, but also includes safeguards against confiscation and damage of property. And rights are to be protected for everyone. The notion of equal protection has been expanded in the past beyond narrow definitions of equal protection of legal and property rights. In some cases, it is the stated public objective to promote "equity considerations" beyond narrowly defined legal/property boundaries, to include the "protection of access" to education, health care, good nutrition, sound housing, etc. Examples of PWI based on these needs include educational and public housing facilities, as well as public buildings related to the administration of justice and police protection.

2.2.8 Concluding Remarks on the Underlying Concepts for Needs Rationale

The above are the most frequently cited conceptual rationales for public support of PWI. Historically, these concepts have gained or lost favor as the social, political and economic institutions which shape public sector activity roles and national economic policy have changed. Proceeding from concepts, such as these, to "needs" measurement and actual PWI programs is often not without a leap of faith, particularly if PWI authorizing legislation has not explicitly justified its programs on such grounds. Nevertheless, a rationalization for the majority of PWI programs can be developed using the above concepts. This is illustrated below in Section 4.2.

2.3 Measurement of Aggregate "Needs"

Whichever conceptual needs rationale is advanced, it must ultimately be translated into specific, quantitative expressions, i.e., public works obligations, authorizations and expenditures, in order to achieve these conceptual objectives. Historically, PWI has progressed from such conceptual rationales to concrete realization in a wide variety of functional areas, e.g.:

- Highways;
- Mass transit;
- Airports;
- Railroads;
- Sewer lines/treatment plants;
- Dams, levees, flood protection;
- Water supply systems;
- Educational facilities;
- Health care facilities;
- Public buildings;
- Prisons; and
- Public safety equipment (for police and fire protection).

To assist the public sector in determining what amount of expenditure is "needed" in the aggregate, in each of these functional PWI types, the planning standards approach is frequently used. Here, standards are first established for a specific public works investment category. Next, inventories of the present capital stock and forecasts of "future demand" are estimated. The difference between the standards and the existing future conditions is said to be equal to the "need". Hence, such planning standard "needs" are often derived from physical evaluations of facility capacity or from generalized professional practitioner opinion. Over the years, an array of different kinds of standards have been developed by such professional groups as the American Public Health Association, American Public Works Association, American Association of State Highway Transportation Officials, American Society of Civil Engineers, Urban Land Institute, and many others.

Indeed, various Federal agencies which develop needs studies, regional plans, master plans or comprehensive plans have utilized this concept or some variation thereof. Often, a Federal agency requires states and localities to participate in such an aggregate needs assessment, by having them develop their own comprehensive (state or local) plans which then in turn are used as input into the Federal agency's estimate of aggregate need.

2.4 The Role of the Federal Government in Meeting These Needs

Having developed (or obtained) an estimate of aggregate need for a given type of PWI, representatives of the Federal government initiate the determination -- within the limitations and requirements of the enabling legislation -- of the appropriate public sector role, timing and magnitude relative to meeting this "need".

The key indicator of the Federal government's commitment to a particular type of PWI is Federal legislation which (a) authorizes particular PWI programs and then (b) appropriates funds for particular PWI programs. That is, legislative mandates express the general public view of the nation's objectives. These views may be defined very explicitly, rather vaguely, or somewhere in between. For example, the two rounds of the Local Public Works Program[1] explicitly defined the Federal commitment for that program at $6 billion and then specified allowable categories of investment. In similar fashion, the various legislative mandates initiating construction of the interstate highway system specify route mileage, construction standards, key cities to be connected, and the elements of an overall funding approach. On the other hand, much of the legislation for housing and social welfare in the past three or four decades has included such all-encompassing words as "decent, safe, and sanitary" as basic determinants, from which need could be measured. However, general or explicit legislatively generated needs estimates may be, in any given instance, its authorizing legislation (and supporting documentation) does serve to indicate a public objective for each kind of public works investment program.

Appropriations bills, on the other hand, clearly state what is to be invested in, and how that investment is to be programmed over time. In other words, appropriations reflect the final figure derived through political bargaining, the efforts of coalitions and interest groups and the process of accommodation.

Many factors, of course, influence the role that the elected representatives of the Federal government are willing to assume for PWI -- in the aggregate and by function at any given time, e.g.:

- General economic conditions, nationally and regionally;
- Aggregate measures of "need" (current and future);

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[1] Local Public Works Capital Development and Investment Act of 1976 (P.L. 94-369) and Public Works Employment Act of 1977 (P.L. 95-28).

- Congressional membership and philosophy regarding appropriate roles for the public sector;
- Executive branch program priorities;
- Societal pressures for expenditures in certain PWI functional areas; and
- The condition of capital markets (both in monetary and real terms).

The influence of such factors, taken together, are more likely to affect the overall magnitude of PWI, across-the-board -- rather than the degree to which any one functional type is "needed" more than others. Therefore, "macro-factors" are not discussed further in this section as "needs". Rather, this overall magnitude -- however selected -- provides the general economic and political environmental context within which individual PWI program areas must make their arguments and defenses.

2.5 Federal Determination of Relative Need: Time, Place, Type, and Targeted Population

After Federal funds have been appropriated, various mechanisms are utilized to determine relative need or, in other words, to distribute these funds among recipients, i.e., to state and local governments, or, if direct Federal expenditures, to particular projects, within the jurisdiction of each Federal agency involved.

A common Federal PWI program practice is to use a formula approach to determine "relative need" among states, for instance. That is, funds are allocated to states according to a formula established by Federal legislation or rules and regulations. Variables used in the formula are often specified in the legislation and operationalized through rules and regulations. The formulae are as varied as the PWI programs, and the variables used tend to be specific to the PWI program to which it is associated. Once a state receives these formula grants, the grant formula can usually be used for projects within the state in accordance with priorities determined by the state.

Another mechanism utilized to distribute funds is to grant funds for individual projects in response to applications received from states and localities. These project grants (or "discretionary funds") permit the Federal agency to explicitly determine relative need among projects.

An indicator of relative priority used by Federal agencies is the matching requirements that must be met before funds will be obligated. Matching requirements can vary dramatically both within a PWI program

and between PWI programs, and are usually specified in the legislation or by rules and regulations. Different types of expenditures within a given PWI program may have different matching requirements. Moreover, matching requirements can also be a function of the type of recipient (e.g., the financial ability of the recipient to provide matching funds).

2.6 The Expenditure of Resources

In the final analysis, the Federal government's obligation and outlay of funds indicate the actual expenditures made in order to promote the development and expansion of public works. That is, planning standards can and do imply what is considered "ideal" or desirable. Legislative mandates suggest the Federal government's role in providing for PWI. Appropriations suggest what the Federal government is willing to invest. Formulae, matching requirements and discretionary funding can suggest relative needs and priorities as perceived by the Federal government. However, outlays clearly show what the Federal government has actually invested over time and, thus, offer a useful benchmark against which to measure the Federal perspective for public works investment.

3.0 SELECTION AND REVIEW OF FEDERAL PWI PROGRAMS

3.1 Introduction

The purpose of this chapter is to explain the procedure adopted to review the methods used by various Federal agencies both to determine the "need" for PWI and to allocate Federal funds for PWI to states and localities. First, the rationale for focusing on selected Federal PWI programs is provided (including why the particular programs selected for review were chosen). Then, the program by program review process used in this task is delineated (including the most important data sources that aided the review).

3.2 Selection of Federal PWI Programs for Review

In undertaking this review, the effort was focused in two ways: by PWI functional category and by Federal agency. The functional categories included those specified in the Department of Commerce's Statement of Work for this project, i.e.:

- Highways and other transportation facilities;
- Mass transit;
- Airports;
- Sewer lines/treatment plants;
- Dams, levees, local flood protection;
- Water supply systems;
- Schools;
- Hospitals and other health care facilities;
- Public buildings;
- Prisons; and
- Police and fire protection.

The Federal agencies in this task included those specified in the Statement of Work plus several others, i.e.:

- Department of Agriculture;
- Department of Commerce - Economic Development Administration;
- Development Administration;
- Department of Defense - Army Corps of Engineers;
- Department of Health, Education and Welfare;
- Department of Housing and Urban Development;
- Department of Interior - Bureau of Reclamation;

- Department of Justice - Law Enforcement Assistance Administration and Bureau of Prisons;
- Department of Transportation; and
- Environmental Protection Agency.

As this task proceeded, it became clear that many of the functional areas were too broad to cover from a needs perspective (e.g., all health care facilities, all types of public buildings). Moreover, time and resource constraints prohibited such a massive review. Thus, this task was limited by focusing on key Federal PWI programs/agencies within and across each functional area. In developing the list of key Federal PWI programs/agencies, a number of factors were considered:

- Inclusion of such categories selected from all PWI functional areas previously specified;
- Inclusion of all Federal agencies previously specified;
- Concentration on programs that deal primarily with construction, renovation or replacement of facilities, rather than programs that deal with expenditures that are not primarily PWI in nature;
- Inclusion of programs where the Federal government spends the money directly, as well as Federal grant-in-aid programs and Federal loan programs; and
- Inclusion of Federal PWI programs that historically and/or currently represent a significant portion of either direct PWI expenditures by the Federal government, or grant-in-aid or loan programs.

Exhibit 3.1 contains this list of PWI programs with the Federal agency that administers the program.[1] The major type of financial assistance and the primary PWI functional areas associated with each program are also indicated. As can be seen, most programs are Federal grant-in-aid programs, although three programs involve direct expenditures by the Federal government. In fiscal year 1974, these programs represented

[1] The information needed to make these program selections was obtained as a result of a general literature review. However, particular data sources that proved most useful include: Congressional Quarterly Service, Congress and the Nation, Vol. I: 1945-1964; Vol. II: 1965-1968; Vol. III: 1969-1972; and Vol. IV: 1973-1976, Washington, D.C.; OMB, Special Analyses - Budget of the United States, Appendix on "Federal Public Works Activities", various years; and OMB, Catalog of Federal Domestic Assistance - 1978, May 1978, Washington, D.C.

Exhibit 3.1: Federal PWI Programs for Focusing the Needs Assessment Methodology Review

Program Name or Description and Federal Agency Administering Program	Type of Financial Assistance			PWI Functional Area														
				Transportation								Education				Public Safety		
	Direct Federal Expenditures	Federal Grants-In-Aid	Federal Loan	Highways, Streets, Bridges	Railroads	Mass Transit	Airports	Harbor Facilities, Ports	Sewer Lines/Treatment Plants	Water Supply and Distribution	Civil Works: Dams, Flood Control	Elementary & Secondary	Higher Education	Hospitals and Other Health Facilities	Public Buildings	Prisons	Police Protection	Fire Protection
Economic Development Programs																		
. Rural Community Facilities Program/ Farmers Home Administration, USDA		X													X			
. Economic Development Grants/Economic Development Administration, Department of Commerce[1]		X							X	X					X			
. Community Development Block Grants and Loans (and predecessor categorical programs)/Department of Housing and Urban Development[1]		X	X						X	X					X			
Health and Education Programs																		
. Financial Assistance for School Construction in Federally Affected Areas/Office of Education, Department of Health, Education and Welfare		X										X						
. Construction, Reconstruction and Renovation of Academic Facilities/Office of Education/ Department of Health, Education and Welfare		X	X										X					
. Hill Burton Hospital (and other health facilities) Construction and Renovation Program/ Health Resources Administration, Department of Health, Education and Welfare		X	X											X				
Law Enforcement Programs																		
. Federal Prison Construction/Bureau of Prisons, Department of Justice	X															X		
. Law Enforcement Assistance to State and Localities for Strengthening Law Enforcement and Criminal Justice/Law Enforcement Assistance Administration, Department of Justice		X													X	X	X	X

[1]Most all functional areas could be represented by these programs. Those PWI functional areas indicated are those where the bulk of Federal funding has historically gone.

Exhibit 3.1: Federal PWI Programs for Focusing the Needs Assessment Methodology Review (continued)

Program Name or Description and Federal Agency Administering Program	Type of Financial Assistance			PWI Functional Area														
				Transportation								Education				Public Safety		
	Direct Federal Expenditures	Federal Grants-In-Aid	Federal Loan	Highways, Streets, Bridges	Railroads	Mass Transit	Airports	Harbor Facilities, Ports	Sewer Lines/Treatment Plants	Water Supply and Distribution	Civil Works: Dams, Flood Control	Elementary and Secondary	Higher Education	Hospitals and Other Health Facilities	Public Buildings	Prisons	Police Protection	Fire Protection
Transportation Programs																		
• Airport Development Aid Program/Office of Airports, Federal Aviation Administration, Department of Transportation		X					X											
• Federal Aid Highway Program/Federal Highway Administration, Department of Transportation		X		X														
• Railroad Rehabilitation and Improvement Loan Program/Federal Railroad Administration, Department of Transportation		X	X		X													
• UMTA Capital Improvement Grants and Loans (Formula and Project)/Urban Mass Transit Administration, Department of Transportation		X	X			X												
Water Supply - Wastewater Treatment Programs																		
• Water and Waste Disposal Systems for Rural Communities/Farmers Home Administration, Department of Agriculture		X							X	X								
• Construction Grants for Wastewater Treatment Works/Environmental Protection Agency		X							X									
Watershed - Flood Prevention Programs																		
• Watershed Protection and Flood Prevention/Soil Conservation Service/Department of Agriculture		X									X							
• Flood Control, Navigation and Multiple Purpose Projects with Power Facilities/Army Corps of Engineers, Department of Defense	X							X										
• Irrigation and Multiple Purpose Projects with Power Facilities/Bureau of Reclamation, Department of the Interior	X									X	X							

in excess of 75 percent of all Federal (i.e., grants, loans, and direct expenditures) outlays for non-defense public works investment.[1]

Given the thrust of this task (i.e., a general review of methods used by various Federal agencies to allocate Federal funds for PWI), narrowing the focus in this manner (i.e., to key Federal agency PWI construction, renovation and replacement programs) has not detracted from achieving the objectives of this task. More importantly, it has permitted a more in-depth study and review of significant Federal PWI programs in operation over the last 20-30 years.

3.3 The Program by Program Review Process

The principal goal of this task has been to gather and process information pertaining to a substantial number of particular public works investment programs representative of the Federal government's activity in this area. The unique aspect of this task has been to develop historical insights of how public works investment "needs" have been and are determined. In order to gain this perspective, regulatory histories pursuant to legislative changes had to be carefully investigated on a program-by-program basis.

Answers to identical questions about each program were developed, with each question conceived in such a way as to allow the individuality of the program to be preserved. These questions were designed so that: 1) each program's objectives, scope and history would be adequately described; and 2) all pertinent information would be gathered relative to how each program went about determining needs and relative priorities for allocating PWI funds among states and/or localities.[2]

In all cases, the goal in collecting this information has been to provide, for parties with PWI responsibilities, the basic features of each Federal PWI program and what are believed to be the most important, salient changes that have occurred over the historical period. Exceptions to the general rules and minor legislative or administrative changes have

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[1] OMB, Special Analyses - Budget of the United States Fiscal Year 1974, "Special Analysis O: Federal Public Works Activities."

[2] Addendum A to this appendix contains a detailed list of the topics included in each program summary, as well as the program-by-program summary of each Federal PWI program.

usually not been delineated, unless these were considered relevant in understanding the scope and nature of the program.[1]

[1] Among the sources utilized were: Congressional Quarterly Service, Congress and the Nation, Vol. I: 1945-1964; Vol. II: 1965-1968; Vol. III: 1969-1972; Vol. IV: 1973-1976, Washington, D.C.; OMB, Catalog of Federal Domestic Assistance, May 1978, Washington, D.C.; and Code of Federal Regulations, Office of the Federal Register, National Archives and Records Service, General Services Administration, various dates. The study team also reviewed relevant reports published by the General Accounting Office (GAO), Congressional Budget Office (CBO), the Advisory Commission on Intergovernmental Relations (ACIR), and others. Finally, the study team also obtained and reviewed original survey results from a 1975 survey conducted by the ACIR (hereafter referred to as the "1975 ACIR survey"). (Addendum B to this appendix contains detailed information on this survey; this survey was designed to obtain insights from Federal program administrators about how Federal, state and local officials interact with one another in selecting projects for receipt of Federal funds, including funds for PWI.)

4.0 HIGHLIGHTS OF SELECTED FEDERAL PWI PROGRAMS

4.1 Introduction

In this chapter, highlights of the various Federal PWI programs reviewed are discussed. First, the various conceptual categories of need satisfied by the 17 programs are delineated (Section 4.2). The trends in the various funding mechanisms utilized by the Federal government are traced (Section 4.3). This is then followed by a discussion of various characteristics related to needs assessment and measurement, including the changing role of state and local governments in influencing the expenditure of Federal grants-in-aid (Section 4.4).

4.2 Conceptual Basis for PWI Programs

Questions regarding Federal-state relations are, ultimately, constitutional. To the framers of the Constitution, no issues were more basic than the nature of the definition of the Union. Throughout American history, the interpretation of the Constitution's provisions affecting Federal-state relations has been disputed. Potential areas of Federal legislative initiative are limited by the Constitution to specified subjects, leaving state authority supreme in others. In the Bill of Rights, the 10th Amendment to the Constitution attempts to define the boundaries of Federal and state power: "the powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people".

While this division of authority appeared to contain Federal authority within specific limits, some of the "delegated" powers were open to broad interpretation. In recent times, the Federal government's powers to regulate interstate commerce and to tax and spend for the general welfare have been particularly important in justifying the expansion of its responsibilities. During the 1930's the Supreme Court broadened its interpretations of the commerce and general welfare clauses. In 1937 (Helvering vs. Davis), the Court for the first time recognized Congress' power to provide for the general welfare by legislation which did not exercise one of the other enumerated constitutional powers of the Federal government. In determing the boundaries of Federal powers conferred by the general welfare clause, the majority said:

> The discretion, however, is not confined to the Courts. The discretion belongs to Congress, unless the choice is clearly wrong, a display of arbitrary power, not an exercise of judgment ... Nor is the concept of the general welfare static. Needs that were narrow or parochial a century ago may be interwoven today with the well-being of the Nation. What is critical or urgent changes with the times.

In 1956, the Advisory Commission on Intergovernmental Relations considered this and other decisions fundamental in defining Federal-state relations. It concluded that "under judicial doctrine since 1937, the Supreme Court has largely removed itself as a practical factor in determining the economic policies of the states and the Nation."[1] The Commission further noted that "under present judicial interpretations of the Commerce clause, the boundaries of possible national action are more and more subject to determination by legislative action. In brief, the policy making authorities of the National government are for most purposes the arbiters of the Federal system."[2]

Under its power to spend for the general welfare, Congress expanded existing grants-in-aid programs since the early 1960's, and added many new ones (e.g., law enforcement, higher education, economic development). Through matching funds, the Federal government sought to stimulate and support state activities in a wide variety of fields including transportation, health, and education. The Federal government gained new leverage for the pursuit of its policies through its spending power, such as conditioning eligibility for funds upon fulfillment of certain requirements. Additional incentives were sometimes provided for specific objectives, as in the grant of additional funds for Interstate highways from which billboards were excluded.

While the Supreme Court generally left Congress free to determine the boundaries of Federal economic and social powers, it restricted Federal action in the area of civil and political rights. Relying largely on the 14th Amendment's ban against state denial of "equal protection of the laws," the Court attacked state policies of racial segregation. Under the Amendment's due process clause, the Supreme Court continued a trend of extending to the states the guarantees of civil liberties contained in the first eight amendments to the Constitution.

The above constitutional basis for the Federal government's role in PWI can readily be related to the conceptual categories of need delineated in Section 2.2, above, i.e.:

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[1] Advisory Commission on Intergovernmental Relations, Final Report, 1956, p. 29.

[2] Advisory Commission on Intergovernmental Relations, op. cit., p. 59.

Constitutional Basis	Conceptual Category of Need
Promotion of Commerce	Promotion of Commerce Encouragement of Economic Development
Provision of General Welfare	Protection of Citizenry: Health Countercyclical Measures Improvement of Quality of Life Public Interest
Due Process	Equity: Protection of Civil Rights and Property
Equal Protection	Protection of Citizenry: Defense Equity: Protection of Civil Rights and Property

As is indicated, a correspondence can generally be made with very little overlap.

In Exhibit 4.1,[1] an attempt is made to classify the 17 PWI programs analyzed in this report according to the conceptual categories of need satisfied by each PWI program.[2] For each program, both the primary conceptual category of need as well as additional categories of need are indicated. In making these determinations, the legislative history of each program was used, relying on the program objectives as stated in the enabling legislation. While the categorizations made in this exhibit are subject to debate (particularly the additional categories of need satisfied by each program), they provide a useful framework for analysis.

It is interesting to note that "improvement of the quality of life" is an underlying theme of many of the Federal PWI programs reviewed. Promotion of commerce is satisfied by the transportation related programs, while encouraging economic development is the primary concern of the EDA economic development grants, the Community Development Block Grant (CDBG) program and the Bureau of Reclamation program. In addition, many programs have equity considerations and the protection of civil rights and property as their underlying premise; for example, the Department of Justice and Department of Health, Education and Welfare programs, and two of the Department of Agriculture's programs.

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[1] The reader will note that Exhibits 1.1 and 4.1 are the same. This information is repeated here for ease of understanding.

[2] The conceptual category labelled "the public interest" was excluded from this matrix because all PWI programs can be viewed as being in the public interest.

Exhibit 4.1: Conceptual Categories of Need Satisfied by Various Federal PWI Programs

Program Name or Description and Federal Agency Administering Program	Conceptual Categories of "Need"						
	Promotion of Commerce	Encourage Economic Development	Protect Citizenry - Defense	Protect Citizenry - Health	Countercyclical Measures	Improve Quality of Life	Equity/Protect Rights and Property
Economic Development Programs							
• Rural Community Facilities Program/ Farmers Home Administration, USDA		S				S	P
• Economic Development Grants/Economic Development Administration, Department of Commerce		P			S		
• Community Development Block Grants and Loans (and predecessor categorical programs)/Department of Housing and Urban Development		P				S	
Health and Education Programs							
• Financial Assistance for School Construction in Federally Affected Areas/Office of Education, Department of Health, Education and Welfare		P				S	
• Construction, Reconstruction and Renovation of Academic Facilities/Office of Education/ Department of Health, Education and Welfare						S	P
• Hill Burton Hospital (and other health facilities) Construction and Renovation Program/ Health Resources Administration, Department of Health, Education and Welfare				P		S	S
Law Enforcement Programs							
• Federal Prison Construction/Bureau of Prisons, Department of Justice			S			S	P
• Law Enforcement Assistance to State and Localities for Strengthening Law Enforcement and Criminal Justice/Law Enforcement Assistance Administration, Department of Justice			S			S	P

P = Primary conceptual category of need satisfied by PWI program.
S = Secondary conceptual categories of need satisfied by PWI program.

Exhibit 4.1: Conceptual Categories of Need Satisfied by Various Federal PWI Programs (continued)

Program Name or Description and Federal Agency Administering Program	Conceptual Categories of "Need"						
	Promotion of Commerce	Encourage Economic Development	Protect Citizenry - Defense	Protect Citizenry - Health	Countercyclical Measures	Improve Quality of Life	Equity/Protect Rights and Property
Transportation Programs							
• Airport Development Aid Program/Office of Airports, Federal Aviation Administration, Department of Transportation	P		S				
• Federal Aid Highway Program/Federal Highway Administration, Department of Transportation	P		S				
• Railroad Rehabilitation and Improvement Loan Program/Federal Railroad Administration, Department of Transportation	P	S	S				
• UMTA Capital Improvement Grants and Loans (Formula and Project)/Urban Mass Transit Administration, Department of Transportation	S					P	S
Water Supply - Wastewater Treatment Programs							
• Water and Waste Disposal Systems for Rural Communities/Farmers Home Administration, Department of Agriculture		S		P		S	
• Construction Grants for Wastewater Treatment Works/Environmental Protection Agency				S		P	
Watershed - Flood Prevention Programs							
• Watershed Protection and Flood Prevention/ Soil Conservation Service/Department of Agriculture		S				S	P
• Flood Control, Navigation and Multiple Purpose Projects with Power Facilities/Army Corps of Engineers, Department of Defense	P					S	S
• Irrigation and Multiple Purpose Projects with Power Facilities/Bureau of Reclamation, Department of the Interior		P				S	

P = Primary conceptual category of need satisfied by PWI program.
S = Secondary conceptual category of need satisfied by PWI program.

4.3 Funding Mechanisms

As highlighted in the Summary of Findings, various funding mechanisms have been utilized by the Federal government in its support of PWI. A basic familiarity with these mechanisms is necessary for understanding various characteristics of the needs assessment and measurement process used by Federal agencies. Moreover, funding mechanisms directly influence state and local participation in the needs assessment process.[1]

Generally, Federal funding mechanisms for PWI can be distinguished based on the type of grant -- categorical or block -- and the method of distribution -- formula, discretionary, or direct Federal expenditure. Usually, the type of grant and method of distribution are delineated in the Federal legislation and/or regulations authorizing and implementing the Federal PWI program and, are determined based upon the purpose and effect that Federal legislators want the assistance program to have.

For example, historically, categorical grants were established in response to particular needs or problems that were of national interest or concern. In these cases, Federal funds were authorized primarily to stimulate states and localities to take remedial action in an innovative and new way. Thus, the term "categorical" describes grants-in-aid that are directed at rather narrow objectives or specifically defined needs. Highly prescriptive guidelines and regulations must be followed during application for and then administering of grants-in-aid projects.

Until the mid 1960's, most Federal assistance (i.e., grants and loans) had been in the form of categorical grants-in-aid, by which the Federal government provided funds and collaborated with state or local governments in administering programs bearing both a strong national and state or local interest. However, beginning in the mid 1960's, block grant programs have been increasingly utilized given the trend to decentralize intergovernmental functional responsibilities. Block grants are similar to categorical grants in that funds are awarded for specified purposes on the basis of an application (or plan) setting forth the intended use of funds. They differ, however, in that block grants are for more broadly defined purposes. With block grants, recipients normally play a major role in planning, policy and program development and administration. Moreover, matching requirements tend to be substantially lower; recipients are induced to participate for this reason as well as because these Federal programs are viewed as supportive of state and local efforts to ameliorate problems.

[1] These topics are further discussed below (see Section 4.4).

With the increase in broad based aid to states and localities, new forms of financial assistance -- most notably credit assistance -- were also initiated. Federal credit assistance is provided to borrowers in a number of ways. Various Federal agencies have recently instituted direct loan programs. Federal agencies have also guaranteed the payment of principal and interest on private loans made to special classes of borrowers, as provided by legislation. Often the legislation also provides for subsidized loans whereby the effective interest rates to the borrower are lower than market rates.

Federal assistance programs are also distinguishable by the method of distribution -- formula and/or discretion. Formula grant funds are distributed among all eligible recipients on the basis of a formula, which is, often times, prescribed in the authorizing legislation and/or rules and regulations. Factors such as land area, population, per capita income, fiscal capacity of recipient governments, or a combination of these and other factors, are usually considered. Usually a state plan showing compliance with certain legislative requirements is all that is needed to obtain formula dollars, which often, are then passed-on to local jurisdictions on the basis of some further distribution criteria.

In contrast, discretionary grants require prospective grantees to submit specific project proposals to Federal agencies, which, in turn, review and select proposals in accordance with agency priorities. Discretionary grants are awarded to help solve specific problems and are not distributed among all potential recipients according to any fixed proportions; indeed, discretionary funds, often times, go to recipients with the most expertise in Federal "grantsmanship".

Unlike other discretionary or formula funding programs administered by a particular agency, Congress itself authorizes and appropriates funds directly for the construction of some major public facilities. The Army Corps of Engineers, the Bureau of Prisons, and the Bureau of Reclamation, among others, submit their project-by-project construction plans to Congress for approval. As Federal grants-in-aid to states and local governments have increased in number and total dollar amounts over the last 20 years, the relative size of these direct Federal construction expenditures, in terms of total domestic Federal outlays, has diminished.[1]

4.4 Needs Assessment and Measurement Characteristics for PWI Programs

The earliest criteria for allocating Federal aid funds to recipient jurisdictions was based upon either the proportion of representation in

[1] See Volume I, Chapters 3.0 and 4.0, of this study.

Congress or the number of states (i.e., a uniform distribution). An allocation on the basis of "need" first began in 1879 under a program to distribute books to the blind according to the percent of total blind students in each state. Since that time, a greater variety of formula provisions have been employed and a number of different allocation principles have emerged.

In order to systematically review the needs assessment and measurement procedures used by the 17 public works investment programs in defining and providing for program needs, four topics were utilized:

- Funds allocation by formula-use of recipient need, effort and capability measures;
- Coordination between like programs of different agencies;
- Planning funds; and
- State and local influence in the Federal needs assessment/funds allocation process.

Following a brief description (in Section 4.4.1 below) of the four topics used to qualitatively assess the needs assessment and measurement procedures of the PWI programs reviewed, each PWI program will be discussed (in Sections 4.4.2 through 4.4.7) under one of the following six functional areas -- economic development, health and education, law enforcement, transportation, water supply-wastewater treatment and watershed-flood prevention.

4.4.1 Topics for Reviewing Needs Assessment and Measurement Procedures

4.4.1.1 Funds Allocation by Formula: Use of Recipient Need, Effort, and Capability Measures

Besides tending to equitably distribute Federal funds, formula allocation prevents sudden changes in the amount a state or locality receives. Various independent factors which have statistical meaning have been suggested as a means to analyze allocation formulae. These include measures of need, capability and effort.[1]

[1] U.S. Department of Commerce, Statistical Working Paper 1: Report on Statistics for Allocation of Funds, March 1978, p. 2.

4.4.1.1.1 Measures of Recipient Need

The need for services is a common principle by which Federal assistance is distributed to state and local governments. In some cases, measures of need are quite specific and may be strongly related to actual service requirements and costs; in most cases, an indirect or proxy measure of need is relied upon. One of the most widely used need measures involves an enumeration of some population subcategory like school-age, urban, rural, or farm population. Various income-related statistics like unemployment, average family income, overcrowded housing, and percent of families below the low-income level are also commonly used as measures of need for services.

To the extent that population data for specific groups are used in the needs formula for funds allocation, the technical problems of currency and accuracy that affect population totals are applicable. Although the Census Bureau provides annual estimates of total population for each state, these are not made for many population sub-categories. Thus, some formulae may rely on population estimates of sub-categories that are quite old. Data, for example, for urbanized population or persons aged 15 to 19 years in each state is provided only by the decennial Census.

Moreover, some Census concepts designed for statistical purposes are weak when related to needs formula allocation purposes. For example, the Census Bureau defines "urban" to include communities with 2,500 population and over, whereas a Standard Metropolitan Statistical Area (SMSA) is defined as one or more interrelated counties containing a central city of at least 50,000 population. These two indicators not only differ dramatically when considering the servicing of needs in urban communities of different size, but also when in the context of a state's level of urbanization. For example, Michigan and Missouri had roughly equal percentages of their population residing in urban areas in 1970: 73.8 percent and 70.1 percent, respectively. However, Michigan is considered more metropolitan than Missouri, with 82.9 percent of its residents living in SMSA's, compared with Missouri's 65.0 percent.[1]

Thus, the actual allocation of aid, because of the available data and rough proxies used, may not always direct assistance to ones currently most in need. However, by coupling the growing interest in social indicators research with advances in computer technology, it is probable that needs formulae will consistently improve. There are limits to such improvements because of the increasing difficulty in measuring or defining precisely certain types of social need.

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[1] Advisory Commission on Intergovernmental Relations, Categorical Grants: Their Role and Design (A-52), May 1977, p. 208.

4.4.1.1.2 Measures of Recipient Effort

A common means of relating Federal aid to effort is through matching requirements. That is, within a total amount allocated, the more a state or locality is willing to expend, the more the state will receive in Federal aid. Thus, the total amount of Federal expenditures depends upon the level of activities undertaken by the grant recipients.

Many programs employ a multi-factor formula or include a fiscal capability measure as well (see below) and thus depart from the basic reimbursement principle of rewarding recipients with higher levels of expenditure or service. This is partly explained, no doubt, by evidence that suggests that effort-based grants can disproportionately benefit the wealthier and poorer states.[1] Because the wealthier states have a higher taxable (and taxed) per capita income and likely relatively stronger economic base, they can more easily afford to make expenditures in program areas where Federal matching grants are available. On the other hand, poorer states (when compared to middle income or wealthier states) are oftentimes able to receive more Federal dollars per state dollar spent.

4.4.1.1.3 Measures of Recipient Capability

This method of allocating Federal aid recognizes differences in the ability of state and local governments to finance, through their own tax revenues, various public services. The usual indicator of fiscal capability incorporated in a grant formula is per capita personal income. Frequently, a sliding scale is used in the matching requirements, whereby those jurisdictions having greater fiscal capacity, as measured by per capita income, are required to share a larger part of the cost (i.e., the recipient match would be higher).

Unlike need, capability has never in practice been used as a sole criterion by which aid is allocated. Per capita income as a proxy for capability can enter into allocation formulae in several ways. In some instances, a certain percentage of program funds is allocated to recipients in inverse relation to their income. Income data is also frequently used along with total population as a composite measure of capability. The inclusion of the per capita income factor in a grant formula does not necessarily result in a substantial redirection of funds to low income states; much depends upon the nature of the other formula factors that are used and their relative weights.

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[1] For example, see ACIR, Categorical Grants: Their Role and Design, op. cit., p. 215.

4.4.1.2 Coordination Between Like Programs of Different Agencies

Harold Seidman states, in Politics, Position and Power, that, "the quest for coordination is in many respects the twentieth century equivalent of the medieval search for the philosopher's stone."[1] That is to say, coordination is highly prized but consistently elusive. Administrative coordination has been sought in three different ways: 1) the lead agency approach, by which Congress or the President gives an agency responsibility to coordinate the activities of other agencies in a similar program area; 2) the creation of interagency committees, whereby agency representatives consult formally on an equal basis; and 3) formal interagency agreements about jurisdiction.

There are many administrative means by which various Federal agencies, statutorily committed to similar program objectives, attempt to fulfill this coordinative mission, and many coordinative mechanisms have developed before and since the Intergovernmental Cooperation Act of 1968. However, certain inter- and intra-program coordination matters have not yet been addressed, and integrated grant administration, which provides grantees the opportunity to package Federal funds from different programs to accomplish closely related goals, formalized under the Joint Funding Simplification Act of 1974, has so far provided only limited improvement in dealing with the fragmented Federal grant system.

4.4.1.3 Planning Funds

More than one-half of all Federal grants-in-aid programs provide funds to states and localities for planning. Planning precedes project funding in order to assure, to the extent practicable, that the potential project is a high priority of the locality in terms of the longer-term "master plan".

Planning is an attempt to preclude haphazard community development. The Federal funding of local planning decentralizes decision-making and thus gives local officials the opportunity of conforming national purpose programs to local realities. Planning funds give local officials the responsibility of identifying their needs and asserting their judgment of what specific local services should be available. Thus, the availability of planning funds in each functional area is an important aspect of a program's need determination process because planning can provide for an orderly expenditure of funds and enhance the degree to which Federal programs are sensitive to state and local governmental needs.

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[1] Harold Seidman, Politics, Position and Power - The Dynamics of Federal Organization, New York, New York, Oxford University Press, 1975, p. 190.

4.4.1.4 State and Local Influence in the Federal Needs Assessment/Funds Allocation Process

The American Federal system traditionally has rested upon two partners, the nation and the state. However, cities, recently, have emerged as partners in the American Federal system and the channels between the cities and the Federal government have become broader, deeper and more direct. With the development of this three-way Federalism, the range of state and local activities assisted by Federal grants-in-aid has mushroomed. Thirty years ago, Federal grants supported only such "developmental" functions of government as welfare, health, education, transportation and the conservation and development of natural resources.[1] Federal aid for the primary functions of protecting life and liberty, the administration of justice, and general government (now available) were non-existent then because even the "poor" states were throught to be providing these primary services at adequate levels.

The trends in funding mechanisms (described earlier in Section 4.3) are also consistent with the emergence of this new Federalism. That is, formula-based grants minimize Federal administrative discretion and "grantsmanship", inasmuch as funds are distributed largely on the basis of legal entitlement. This also increases the discretion of state and local governments to use grant funds as state and local priorities dictate. Both formula and special revenue sharing grants are well suited to purposes of supporting state and local provision of services in mature functional areas. Matching requirements serve to stimulate state or local innovation and commitment, but when the Federal emphasis shifts to supplementing recipient fiscal capacity or providing general revenue support, matching requirements tend to be reduced.

In sum, the above discussion has indicated that a variety of factors provide a perspective concerning the role played by states and localities in determining "need". More specifically, qualitative indicators of state and local influence in obtaining Federal grant-in-aid funds include:

- Type of recipient (states directly, localities directly, states and localities directly, states directly and channeling of applications and/or funds to localities through the state);
- Type of grant mechanism (categorical/formula, block/formula, project);
- Matching requirements;

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[1] Advisory Commission on Intergovernmental Relations, Categorical Grants: Their Role and Design, (A-52), May 1977, p. 160.

- Federal grant-in-aid programs for planning to states and localities to develop plans delineating needs and priorities;

- Decentralization of program authority to Federal region level for grant application review, commitment of funds, and/or program review; and

- Federal-state-local interaction during the design and modification of legislation and implementing regulations.

4.4.2 Economic Development Programs

Several Federal programs have been designed to extend fiscal relief to hard-pressed local governments and to provide incentives for private investment in areas experiencing persistent and severe problems of long-term unemployment and depressed income levels. Three economic development programs administered by three different agencies were reviewed: EDA's economic development grant program; USDA/Farmers Home Administration's rural community facilities program; and HUD's community development block grant (CDBG) program.

The HUD program differs from the other two since it is a block grant program (rather than a categorical grant program). In addition, the HUD and USDA programs currently operate under a formula allocation system, while the EDA program is discretionary. Moreover, HUD and USDA have administered their programs for the most part by developing their eligibility criteria through administrative regulations rather than having their criteria specified in the legislation as in the Commerce Department's (Economic Development Administration) case. A final distinction is that the USDA/Farmers Home Administration's community facilities program is aimed primarily at rural areas.

In all these programs, the recipient of Federal assistance must be a local public body -- municipality, county, special agency or authority -- authorized by the state to engage in such activities. A prerequisite for Federal assistance is a workable program for community development, which incorporates: a detailed survey of the community's problems; an administrative organization judged to be effective in terms of program requirements; and provision for active citizen participation. To assist in this planning process, planning tools are made available to recipient jurisdictions.

The categorical grant (loan) programs administered by the Economic Development Administration and the Farmers Home Administration are responsive to locally-initiated projects provided the specific project will foreseeably enhance the success of the community's development plan. The nature of the Federal influence is such as to leave a large measure of autonomy with the communities. The state or regional agency offices furnish technical assistance.

HUD's community development block grant (CDBG) program completely bypasses the state government and establishes a direct Federal-local relationship in virtually all aspects of administration. The major objectives sought are decentralization, economy, and efficiency. Similar to the CDBG block grant, the EDA categorical grant program also seeks to improve the planning, management, and personnel capacity of Federal aid recipients.

With respect to the particular allocation formulae utilized, the Community Development Block Grant (CDBG) program is a mix of formula entitlement, hold harmless,[1] and discretionary funding. The CDBG "blocks" together funding for seven previously separate Federal programs. While past participants (frequently older cities) continue to use their funding generally for projects designed to eliminate existing slums and blighted conditions by rebuilding decayed areas, many new recipients use their funds for more growth-related development programs, in the hopes of preventing future slum or blight conditions. Expanded eligibility provisions now allow funds to go to suburban and rural areas as well as urban communities; 20 percent of program funds are earmarked to a non-metropolitan discretionary account. This raises the possibility that funds may be directed to suburban and rural areas not as needy as some urban areas. Moreover, the possibility is also raised that sufficient funds may not be allocated to each recipient to effectively and efficiently accomplish the intended purposes (i.e., there has been a greater increase in recipients than in funds creating a "dilution" effect -- see below).

The CDBG Act's formula has been attacked on two basic grounds: inadequate data and the utilization of inappropriate needs measures to achieve the desired results. The 1974 Act established a formula based on population, poverty, and housing overcrowding for distributing community development funds among jurisdictions. Both HUD and The Brookings Institution have made extensive studies of the 1974 formula arrangements.

The HUD study[2] found that the 1974 formula was highly responsive to the poverty dimension of community development need, but unresponsive to non-poverty dimensions such as changes in population and employment, population density and renter households. The Brookings study[3] judged that the

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[1] This generally means that a recipient is entitled (at a minimum) to a given percentage of its previous years allocation of program funds.

[2] Bunce, Harold, An Evaluation of the Community Development Block Grant Formula, U.S. Department of Housing and Urban Development (December 1976).

[3] Nathan, Richard P., et. al., Block Grants for Community Development, The Brookings Institution, prepared for HUD, January 1979.

major flaw of the 1974 formula was its unresponsiveness to the severe physical, social and fiscal problems of older deteriorating metropolitan cities. In 1977, Congress replaced the single 1974 formula with a dual formula which included the 1974 one and added a second formula based on poverty (weighted 30 percent), pre-1940 housing (weighted 50 percent) and growth lag[1] (weighted 20 percent).

All measures of need -- population, poverty and overcrowded housing -- are derived from the 1970 Census of Population and Housing. The arguments about the inadequacy of these measures of need have been presented, but it is important to briefly detail formula supporters' reasoning for suggesting that some updating of the decennial data may be desirable but is not as urgent for the CDBG program as for others. Supporters say that the primary problem addressed by the CDBG program is the accumulated shortage of adequate housing and community facilities. They note that the rate at which housing can be planned, placed into construction and completed is probably a minimum of three years from initiation of a housing project to occupancy of the completed project. The argument is concluded with the addition that only one of the components, poverty families, is likely to show very substantial changes over the three year period and, even if one could obtain updated statistics on the number of poverty families for the current year in order to recompute the CDBG entitlement of each area, changes in work underway would not be possible; by the time housing based on the new formula is underway, more current data would again be available to require a change in plans.[2]

Although neither the Economic Development Administration nor the Farmers Home Administration have traditionally allocated program funds on the basis of a formula, both the Economic Development Administration and the Farmers Home Administration use the same measures of need as are used in the CDBG entitlement formulae and therefore face the same problems as to the availability and appropriateness of statistics. It is widely recognized that there are severe data problems in measuring such factors as income, unemployment, and slow or negative job growth at the sub-state level. In a January 1977 report to Congress, the General Accounting Office questioned the reliability of unemployment data and argued that the methodology used to estimate unemployment rates for small areas had

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[1] "Growth lag" is defined as the difference between (1) the population a city or urban county would have had if its population growth rate between 1960 and the date of the most recent population count had been equal to the growth rate of all metropolitan cities during the same period and (2) the current population of the city or urban county. If the city has grown at a greater than average rate, it receives a zero on this variable. See Housing and Community Development Act of 1977; Title I, Section 106, PL 95-128.

[2] U.S. Department of Commerce, Statistical Policy Working Paper 1, op. cit., p. 7.

conceptual weaknesses.[1] Data on family income for states and sub-state areas are only available from decennial Census information, and therefore do not provide a reasonably current measure of income. The reliability of income data for small areas, such as those focused on by the Farmers Home Administration's Community Facilities program, is equally questionable.

4.4.3 Health and Education Programs

Of the three health and education programs reviewed, two -- the Hill-Burton program and the Higher Education Academic Facilities Construction program -- are formula grant programs. Under the Hill-Burton program, funds were originally allocated to states in the ratio which the population of each state, weighted by the square of its allotment percentage, bore to the sum of the corresponding weighted populations for all of the states. The allotment percentage was tied to a state's per capita income. Most recently (since 1974), population, per capita income and facility need were considered in alloting funds. Thus, measures of both "need" and "capability" have been considered by the formula. Moreover, the matching requirements for the program varied, and included capability factors such as urban or rural poverty and per capita income.

Localities received funds from the state according to the state plan (whose development has also been funded by the program). Over the past ten years, states and localities have had increasingly greater influence on the selection of projects to receive Federal funding; however, despite the fact that localities are actively involved in planning, states can overturn local decisions and the Federal government can overturn state decisions (although either rarely occurs).

The Hill-Burton program, nevertheless, was criticized for using a formula that had become outdated prior to its change in 1974. However, Congress was sensitive to changing problems, and in response, expanded the program and shifted the funding emphasis to cope with these changing problems. Thus, the use of an outdated formula was somewhat alleviated. Indeed, a study of the Hill-Burton program found that between 1946 and 1973, Federal funds flowed in accordance with the intentions of the program and with the changing emphasis over time.[2]

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[1] General Accounting Office, Why the Formula For Allocating Community Development Block Grant Funds Should Be Improved, CED-77-2, January 1977, p. 13.

[2] Lave, Judith, et. al., The Hospital Construction Act: An Evaluation of the Hill-Burton Program 1948-1973, American Enterprise Institute for Public Policy Research, Washington, D.C., May 1974.

Higher education academic facility construction grants-in-aid are also alloted using a formula approach. For undergraduate and graduate facilities, need measures in the formula include enrollment in institutions of higher education and enrollment in grades 9-12. Federal funds for public community colleges and/or public technical schools are allocated to states based on the number of high school graduates and each state relative per capita income. Moreover, there are matching requirements in order to receive funds. In addition, under the program's loan provisions, the Office of Education[1] does consider the recipient's ability to secure funding under equally favorable conditions (i.e., a measure of capability is taken into account).

For grants-in-aid the Federal government will provide 50 percent of the cost; for loans -- either direct or subsidized -- the recipient must provide 80-90 percent of the funds. In all cases, the funds go directly to local recipients; however, state education offices influence project selection because applications are channeled through the state and must receive state approval prior to submission to the Federal Office of Education. That is, the projects must be consistent with the state plan in order to receive funding.

Federal grants-in-aid are also awarded to school districts overburdened by Federal activities in their area for the construction of elementary and secondary school facilities. These funds do not require state or local matching and payments are related to per-pupil costs in the areas affected and vary with the category of children involved. Grants are awarded on a discretionary basis by the Office of Education. However, local applications must also be channeled through the state so that the state education agency can certify that the project is consistent with the overall state plan and provide data on per-pupil construction costs. Hence, to the extent that states deem the locality's project inconsistent with the overall state plan (which is not Federally funded), the state does have some influence over project selection. Program authority to review and approve applications is decentralized to the regions and this may play a part in meeting local needs.

The criteria used by the Office of Education to prioritize projects does reflect relative urgency of need. In addition, the eligibility requirements take need into account, e.g., increases in average daily membership (students enrolled in the school district) must meet minimum requirements before a school district can qualify for aid. Moreover, to insure that these minimum requirements are met, applications must be accompanied by pupil surveys documenting the recent increased enrollment as a result of

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[1] Legislation to remove the Office of Education from the Department of Health, Education, and Welfare (DHEW) and make it the Department of Education was passed by Congress and signed into law in October 1979 (P.L. 96-88). However, the reorganization has not yet been implemented; this is expected by the Summer of 1980. At such time, DHEW will be renamed the Department of Health and Human Services.

Federally related activities. Thus, the data to support the eligibility requirements are current and probably accurate. On the other hand, however, capability and effort are generally not explicitly accounted for (e.g., there are not matching requirements) and this has led to some criticisms, because some relatively wealthy school districts have received substantial amounts of aid.

4.4.4 Law Enforcement Programs

Two law enforcement programs were reviewed -- the Federal Prison Construction program and LEAA's grant-in-aid program for prison construction. The Federal prison construction program operated by the Bureau of Prisons (BOP) receives discretionary funding by Congress on a yearly basis. Requests are made by the Bureau of Prisons based on their five year master plan to upgrade the physical facilities of the Federal prison system. Need factors considered include: existing and projected prison population; available bedspace; age and condition of capital stock in light of Federal prison design standards; and, deficiencies with security levels. Also considered is the ability to house Federal prisoners in non-Federal installations.

This procedure, used by the Bureau of Prisons for estimating and scheduling prison construction needs, has come under scrutiny by the General Accounting Office (GAO). For example, in an April 1976 report[1] the GAO found that prison population forecasts were deficient because custody level data maintained by the BOP were inconsistent with data maintained by each institution. Moreover, upper and lower bounds on the forecasts were not routinely done. In addition, the GAO found that optimum prison sizes by security level were not well documented, nor was the capacity of existing facilities known due to a lack of written standards to determine capacity. Finally, the GAO noted that the number of prisoners who could be housed in non-Federal facilities is uncertain and the BOP did not use life cycle costing techniques for determining facility design.

In recent talks with BOP officials, the claim was made that many of these deficiencies have been or are being corrected. In addition, it was learned that the Bureau of Prisons now strongly favors the renovation of surplus military or other government facilities in regions of greatest need because it proves to be an inexpensive way to acquire needed space.

The second law enforcement program reviewed -- LEAA's grant-in-aid program for prison construction -- is a combination formula grant program and discretionary grant program. Monies for the capital improvement

[1] GAO, Federal Prison Construction Plans Should Be Better Developed and Supported, April 12, 1976, GGD-76-10.

projects come from two parts of the LEAA legislation: Part C funds which encourage programs and projects to strengthen law enforcement and criminal justice; and Part E funds which encourage programs and projects for the construction, acquisition and renovation of correctional institutions. Part C funds are distributed primarily by a formula approach; Part E funds are half formula and half discretionary. In all cases, the Federal government requires a 50 percent match, with states (as of July 1973) providing at least half of the required match. Moreover, LEAA specifies how much of the state's formula monies must be passed on to local governments.

The formula funds are distributed to states based upon relative population. Thus, the measure of need is a rather simple one (i.e., population) and effort is accounted for in the matching requirements. More complex measures of need (e.g., extent of crime among a particular jurisdiction's population) have been recently proposed, as well as incorporating a more complex measure of effort (e.g., criminal justice expenditures at the state level weighted by the nature and extent of that jurisdiction's tax effort).[1] Both of these variables would provide an allocation of funds utilizing measures more identifiable with a criminal justice grant-in-aid program; however, a tradeoff to be considered is the reliability, accuracy and currency of the data necessary to implement the formula.

Discretionary funds for prison construction allocated by LEAA utilizing the following basic factors:

- Use of alternatives to incarceration;
- Physical condition of facility; and
- Specification of need based on inmate population, cited deficiencies in jail inspection reports, court orders, and use of advanced techniques or other nationally recognized standards.

Thus, here too, a measure of need is the primary consideration. A measure of effort is accounted for through the matching requirement.

Another top priority of the LEAA program was the development of a criminal justice planning capacity which would be composed of full-time staff to receive glock grants and make subgrants to state and local governments.

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[1] Congressional Record-Senate, January 29, 1979, pp. S765-766 (outline of the proposed Justice System Improvement Act).

Therefore, planning grants are also available -- via a formula approach to states -- to State Planning Authorities (SPA's). The SPA's, in turn, create regional planning units (RPU's) if other multi-jurisdictional organizations are not in existence. The Act requires that at least 40 percent of allocated planning funds be made available to local governments or several local government units. Moreover, the SPA is responsible (with input from the RPU's) for the development of an annual comprehensive state plan. Another function of the SPA is (for formula monies) to determine grant awards to state agencies and to local governments (within the overall state allocation of funds to local agencies). The only condition is that grant funds cannot be spent by the state or allocated to localities or RPU's unless the LEAA has approved the state's annual comprehensive plan and the project in question is a part of the state plan.

A 1977 ACIR report states that "four-fifths of the states have adopted policies that exclude certain activities from funding and encourage others, with the result of reducing local flexibility".[1] The impact of these strings, however, may be difficult to predict or to measure. For example, under a Federal-state block grant, some local officials may not perceive any significant differences between block and categorical grants in the degree of discretion they are allowed to exercise over the use of funds. On the other hand, in response to an ACIR survey, 43 percent of the SPA directors indicated that they had "great" discretion over the control and use of funds and 61 percent reported having "great" discretion in establishing action grant categories. With respect to the discretionary funds, although the LEAA has control in the ultimate selection of projects, localities' applications for these discretionary monies must conform to the comprehensive state plan. Thus, states again do retain some influence.

Recently, numerous reports have been prepared discussing the success and failures of the LEAA program.[2] The major weaknesses of the LEAA program can probably best be summed up by the proposed Justice System Improvement Act presented in Congress in January 29, 1979. Major organizational and administrative changes were proposed within LEAA and the

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[1] Advisory Commission on Intergovernmental Relations, Block Grants: A Comparative Analysis, (A-60), October 1977, p. 20.

[2] For example: ACIR, Safe Streets Reconsidered: The Block Grant Experience 1968-1975, January 1977; GAO, Federal Crime Control Assistance: A Discussion of the Program and Possible Alternatives, January 27, 1978; GGD 78-28; GAO, Long-Term Impact of Law Enforcement Assistance Grants Can Be Improved, December 23, 1974, GGD 75-1; GAO, Overview of Activities Funded by LEAA, November 29, 1977; GGD 78-21; GAO, Conditions in Local Jails Remain Inadequate Despite Federal Funding for Improvements, GGD 76-36, April 5, 1976; CBO, Federal Law Enforcement Assistance: Alternative Approaches, April 1978.

funding mechanisms would also be revampled. Of interest to this study would be the "prohibition on the use of LEAA funds for construction since there is simply not enough money for such efforts".[1]

4.4.5 Transportation Programs

The Federal government allocates transportation grants in all four transportation programs reviewed (covering airports, highways, railroads and mass transit) primarily on the basis of need. The criterion common to all four needs allocation formulae is a population measure: enplaned passengers and population for airport funding; relative urban and rural population for non-Interstate highway program funding; urban population and population density for urban mass transit; and finally "population benefitted by construction of the service" for the Federal Railroad Administration.

In the case of highways and airports, the proportion of Federal grant assistance is increased on the basis of relative land area, which adjusts the Federal contribution upward vis-a-vis reduced state capability to account for the presence of public lands. While the relative land area factor only benefits eight states participating in the Federal Aid Highway Program, the Federal Airport Act of 1946 as amended, permits the Administrator of the Federal Aviation Administration to offer more favorable cost-sharing arrangements to states that have at least five percent of their land in unappropriated and unreserved public lands and non-taxable Indian lands. It should be noted that the Interstate Highway System's monies are allocated on a cost-to-complete basis, whereas other highway monies are apportioned according to actual construction expenditures, a measure of effort.

In all four transportation programs, states must complete a state plan and describe the relationship of the specific project to realization of that approved plan. In all cases, these state plans are approved or disapproved by the regional office of the Federal agency with the U.S. Department of Transportation. These regional offices also have a major responsibility for program review. Since the passage of the Federal-Aid Highway Act of 1956, regional offices' role has markedly changed, concommitant with increased Federal involvement in the transportation function. During the 1960's and 1970's, mass transit aid programs and the National Rail Passenger Corporation were established and the formula allotments for highway and airport aid were revised considerably. It is only in the last eight years or so that real transit planning, of a caliber equal to highway planning, has occurred; it is possible that the regional offices

[1]Congressional Record-Senate, January 29, 1979, pp. S765-766.

of the Federal agencies will be given the role of integrating the shared responsibility for transportation planning and service delivery among all levels of government.

Despite the fact that needs assessments are required in all four programs and that Federal funds are available for conducting the needs survey in all but the Federal-aid highway programs, critics maintain that states and localities have been discouraged from establishing intermodal transportation planning activities because of the Federal piece-meal approach to administering programs specific to each mode. In response to these criticisms, in 1973 and again in 1974, the Federal Aid Highway Act was amended and the National Mass Transportation Assistance Act enacted. Together these statutes gave a strong incentive to states to develop multi-modal transportation departments, responsive to overall policy control by the Governor and enabled the use of highway trust funds for mass transit purposes. As a result of expanding the use of Federal highway funds for multi-modal purposes, Congress stated its belief that the modal administrations within both the U.S. Department of Transportation and the state transportation bureaus would necessarily acquire a broader perspective.

Increased local planning should improve intergovernmental coordination. The very fact that transportation systems reach beyond a locality's service area and as such become the responsibility of state and Federal government, indicates the necessity of intergovernmental cooperation in terms of both planning and funding. Moreover, if transportation responsibilities were properly coordinated by the state transportation bureaus, local projects would more likely be consistent with regional and statewide systems and complement national projects without unnecessary disruptions at any level.

4.4.6 Water Supply and Wastewater Treatment Programs

Two water supply and wastewater treatment programs were reviewed: one administered by the EPA and one by the Farmers Home Administration. Federal funds are allocated to this functional area through the formula approach. The formulae are need related, with population the statistic used in each. Originally the Farmers Home Administration employed the need proxies of relative rural population and rural per capita income, weighted two to one, respectively. More recently, the weights have changed to fifty-fifty and poverty households in rural areas was substituted for per capita income. The Environmental Protection Agency allocates funds on the basis of the construction cost of meeting legislated standards which is calculated at the local level, with present and future populations to be served given considerable import. In both programs, the states have adopted a crude approach to project selection (i.e., readiness-to-proceed), partly due to the fact that both programs needed to accept low priority choices in order to get the programs moving.

In the Farmers Home Administration program, Federal grants are made to localities to construct waste treatment facilities, with the Federal responsibility for total capital expenditures being 75 percent. In the Environmental Protection Agency's program, the locality's matching requirements are also low and can be further reduced if the locality is not capable of selling bonds to meet the established level of matching for the costly facilities. Local government expenditures for water supply and sewerage services have traditionally been financed by borrowing as states have only in recent times begun to provide grants to local governments to help finance their water and sewer facilities.

Both the EPA and Farmers Home Administration provide planning funds to help local governments consolidate their water services to achieve economies of scale and coordinate the provision of water services vis-a-vis planning for future community growth. The regional offices of the Farmers Home Administration, according to the recipient of the 1975 ACIR survey, not only review and approve communities' grant/loan applications, but also have a major responsibility in reviewing the program; the regional offices also commit program funds. The EPA uses its regional offices to hold meetings with local representatives who assist the agency in developing its construction cost estimates. The regional offices also have a considerable amount of authority to review the program and judge the priority ranking of competing construction projects.

Intergovernmental relations are strong and seem workable. Both programs are cognizant of the locality's needs and particular situation in most respects of project selection. The exception is that readiness-to-proceed and financial need are often given more relative weight by the local, state, and regional governmental entities, rather than Federal criteria which accord attainment of pollution control and health standards primary importance.[1] Due to this fact, localities select the projects to receive technical and management assistance from the EPA and Farmers Home Administration, but the Federal agencies then determine which competing projects should be funded and in what sequence.

4.4.7 Watershed-Flood Prevention Programs

All three flood control programs -- Army Corps, Soil Conservation, and Bureau of Reclamation -- involve direct Federal expenditures. In the case of the Army Corps and the Bureau of Reclamation, these expenditures are explicitly authorized by Congress. Although Federal funds are not allocated on the basis of a formula to states or localities, they are disbursed on the basis of benefit-cost calculations; the assumption is

[1] For example, see General Accounting Office, Management of Farmers Home Administration's Water and Waste Disposal Program Needs To Be Strengthened (CED-78-61), March 1978.

that projects that have a high benefit-cost ratio in this functional area will be built before projects with a lower ratio, and none with a ratio less than one will be undertaken.

Prior to facility construction, each of these three services engages in extensive planning. Planning funds are a separate line item in each agency's budget. The Congress typically reviews the Army Corps of Engineers' and Bureau of Reclamation's plans to assess project feasibility and necessity before the project is congressionally authorized. The Soil Conservation Service's projects are not individually reviewed by the Congress in that they are smaller projects, in both acreage and dollars involved.

Coordination between these three similar programs has, historically, been minimal. The lack of strong coordination between these agencies is not necessarily a deficiency, but rather reflective of their individual legislative charters. In 1936, Congress assigned to the Soil Conservation Service the responsibility for controlling floods through upstream water control methods; the Flood Control Act of 1936 envisioned a division of responsibility, whereby the Army Corps would be involved in the construction of large storage dams and embankments downstream, and upstream flood prevention projects would be the province of the Soil Conservation Service. Neither the Service nor the Corps is involved in project planning or construction in the 17 western states in which the Reclamation Bureau provides water for municipal, industrial, irrigation and related users. Though there is relatively little coordination between these three programs, all three do coordinate with other Federal, state and local government agencies to ascertain the willingness of the communities to include recreation features in the Federally-funded projects. The 1962 Flood and Agriculture Act provides that Federally-funded watershed or flood prevention projects may include recreation facilities. However, in this case, construction costs of these facilities must be paid for by the benefitted community.

In all three programs, state and local participation is provided in other ways as well. In the case of the Soil Conservation Service, a watershed project is initiated and carried out by the locality, with the concurrence of the governor and the USDA state conservationist. The Corps responds to a locality's formal request for construction of a facility, investigates the economic feasibility and necessity of the project, and judges the interest(s) of the affected state in the facility when preparing the benefit-cost analysis. The Bureau of Reclamation usually initiates consideration of projects, but does not proceed with them until sufficient local support is demonstrated; grass roots cooperation is particularly necessary because of the reimbursement requirement of the Reclamation Act. Localities, in the case of all construction projects, must demonstrate that they can and will maintain, operate, and repay (reimburseable) those costs which are deemed not to coincide with Federal water resource project purposes. The Flood Control Act of 1944 and the River and Harbor Act of 1945 explicitly recognize the interests and rights of states to develop, utilize and control water resources within their borders.

In the case of the Army Corps, the peak of its construction program occurred 20 to 30 years ago when most of the large dams in the major river systems were constructed; in constant dollars, the Corps' 1977 construction program budget was about 65 percent of what it was ten years ago and its 1977 operation and maintenance budget was about 165 percent what it was ten years ago.[1] The Bureau of Reclamation, on the other hand, is likely to experience smaller annual authorizations, although this will not immediately affect construction work in progress. Several years ago, the Bureau had a backlog of authorized but unfunded projects exceeding $6 billion; assuming these authorizations are used at the present annual rate of expenditure, the Bureau has some 20 already authorized years of construction to perform. The Soil Conservation Service's annual level of obligations has increased in current dollar terms over the past five fiscal years, and its former rural orientation has been expanded to serve urban interests.

Although, Federal funds for watershed - flood prevention programs are allocated on the basis of need as calculated by use of a benefit-cost ratio, the procedures used by each program vary. One of the principal objectives of the Water Resources Council, established in 1965 by the Water Resources Planning Act, was to standardize how the Federal water resource construction agencies (Reclamation Bureau, Corps of Engineers, Soil Conservation Service, and Tennessee Valley Authority) implement the benefit-cost ratio concept. Because the benefit-cost analyses developed and reported to the Congress by these agencies in the past provided dissimilar information about the economic necessity of proposed projects, the Water Resources Council has developed broad principles and standards to be applied by each water-related agency. However, the various agencies have applied and interpreted the Council's procedures in different ways from each other, thereby making their individual benefit-cost ratios still difficult to compare. The problem is believed to originate at the district and regional offices of these agencies, which use different steps and assumptions to compute project benefits and costs -- although national level differences also continue to exist.

President Carter in his June 6, 1978, National Water Policy message stated that: (1) more consistent, uniform benefit-cost analysis is needed; and (2) independent reviews should be performed to insure that uniform and consistent analyses both within and between agencies are being conducted. This proposed change recognizes that, unlike the past when Federal agency planning was project-oriented, current trends in planning place greater emphasis on much broader objectives than the construction of new projects. Multi-interest and multi-disciplinary planning is now

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[1] Department of Army, Office of Chief of Engineers, Civil Works Expenditures by State and Year, September 1977.

the norm and local participation in the planning process has increased. Moreover, the recommendations resulting from the Water Resources Council review may enable the reconciliation of conflicts between national priorities and objectives versus regional and local goals. The comparability and compatibility of Federal water agencies' plans should reduce fragmentation.

ADDENDUM A: PROGRAM SUMMARIES

This addendum provides program summaries for the 17 Federal PWI programs reviewed. Topics in each program are:

- PWI functional areas addressed in this study;
- Conceptual category of need satisfied by the PWI program;
- Type of Federal program (e.g., Federal grant-in-aid with/without matching by state and locality; Federal low interest loan; Federally subsidized loan; direct Federal expenditure);
- Authorizing legislation;
- Implementing rules and regulations (e.g., Code of Federal Regulation citation);
- Program objectives (as stated in Federal legislation or U.S.C. authorizing PWI program);
- Program scope (e.g., new construction, renovation, equipment purchase);
- Year program was initiated and years when major changes were made;
- Type of Federal grant or loan mechanism (e.g., categorical -- formula, discretionary (project) or formula/project; block-formula, discretionary or formula/project);
- Type of recipient (Federal agency; state agency; locality; some combination);
- Eligiblity and application requirements for state and/or locality to receive Federal funds (e.g., a comprehensive state plan must be submitted and approved; project applications must be submitted and approved);
- Federal funds allotment procedures and matching requirements (i.e., how Federal funds are distributed among states and/or localities; formula approach to state -- with specified pass-through to locality -- and via state plan to localities; discretionary funding by Federal agency; discretionary funding by Congress; some combination of these);
- Factors used in determining the Federal allotment (e.g., key indicators -- variables -- of relative need);
- Agency or Congressional rationale for using this allotment procedure and variables;
- Degree to which states and localities influence project selection (i.e., the expenditure of allotted Federal funds);
- Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations;
- Strengths and weaknesses of the needs assessment/funds allocation process;
- Information on Federal funding for the PWI program (authorizations and appropriations); and
- Primary data sources for completing summary sheet.

The reader should realize that the purpose of these summaries is to provide, in a systematic fashion, a broad overview for understanding the needs methodologies utilized by these various Federal PWI programs. The basic features of each PWI program and what are believed to be the most important, salient changes that have occurred over the historical period are included. Exceptions to the general rules and minor legislative/administrative changes normally are not delineated, unless these are considered relevant in understanding the scope and nature of the program.

The program summaries are grouped by broad functional area and are alphabetically arranged by Federal department within each functional area as follows:

	Page
Economic Development Programs	G.54
Rural Community Facilities Program/Farmers Home Administration, Department of Agriculture	G.55
Economic Development Grants/Economic Development Administration, Department of Commerce	G.64
Community Development Block Grants and Loans (and predecessor categorical programs)/Department of Housing and Urban Development	G.71
Health and Education Programs[1]	G.77
Financial Assistance for School Construction in Federally Affected Areas/Office of Education, Department of Health, Education and Welfare	G.78
Construction, Reconstruction and Renovation of Academic Facilities/Office of Education, Department of Health, Education and Welfare	G.85
Hill-Burton Hospital (and other health facilities) Construction and Renovation Program/Health Resources Administration, Department of Health, Education and Welfare	G.91

[1] P.L. 96-88, establishing the Department of Education and renaming DHEW the Department of Health and Human Services, was signed by President Carter on October 17, 1979. However, this law has not yet been implemented; this is expected by the Summer of 1980. At such time, the Education Division shall terminate.

	Page
Law Enforcement Programs	G.97
Federal Prison Construction/Bureau of Prisons, Department of Justice	G.98
Law Enforcement Assistance to States and Localities for Strengthening Law Enforcement and Criminal Justice/Law Enforcement Assistance Administration, Department of Justice	G.103
Transportation Programs	G.109
Airport Development Aid Program/Office of Airports, Federal Aviation Administration, Department of Transportation	G.110
Federal Aid Highway Program/Federal Highway Administration, Department of Transportation	G.120
Railroad Rehabilitation and Improvement Loan Program/Federal Railroad Administration, Department of Transportation	G.134
UMTA Capital Improvement Grants and Loans (formula and project)/Urban Mass Transit Administration, Department of Transportation	G.146
Water Supply - Wastewater Treatment Programs	G.156
Water and Waste Disposal Systems for Rural Communities/Farmers Home Administration, Department of Agriculture	G.157
Construction Grants for Wastewater Treatment Works/Environmental Protection Agency	G.181
Watershed - Flood Prevention Programs	G.190
Watershed Protection and Flood Prevention/Soil Conservation Service, Department of Agriculture	G.191
Flood Control, Navigation and Multiple Purpose Projects with Power Facilities/Army Corps of Engineers, Department of Defense	G.202
Irrigation and Multiple Purpose Projects with Power Facilities/Bureau of Reclamation, Department of the Interior	G.212

ECONOMIC DEVELOPMENT PROGRAMS

Rural Community Facilities Program/Farmers Home Administration, USDA

1. PWI functional areas addressed in this study.

   - Public buildings.
   - Fire protection.

2. Conceptual category of need satisfied by this PWI program.

   - Protection of civil rights and property (primary).
   - Encouragement of economic development.
   - Improvement of quality of life.

3. Type of Federal program.

   - Guaranteed/insured loans.

4. Authorizing legislation.

   - Consolidated Farm and Rural Development Act of 1972 (P.L. 92-419), Section 306 (7 U.S.C. 1926).

5. Implementing rules and regulations.

   - 7 CFR 1933, Subpart A.

6. Program objectives.

   - To construct, enlarge, extend, or improve community facilities providing essential services to rural residents.

7. Program scope.

   - Community facilities include those providing or supporting overall community development such as fire and rescue services, transportation, traffic control, community social, cultural, health, and recreation benefits as well as industrial park sites, access ways and utility extensions. All facilities shall be for public use.

8. Year program was initiated and years when major changes were made.

   - In his January 11, 1954 Farm Message, President Eisenhower declared that something must be done for farmers with very low incomes. He directed the Agriculture Department to prepare a study and recommendations, which were released April 26, 1955 under the title of "Development of Agriculture's Human Resources -- A Report on Problems of Low Income Families". The report made 15 recommendations,

whose objectives were to bring about a substantial improvement to low income families. President Eisenhower, by Executive Order 10847, subsequently established a sub-Cabinet level Committee for Rural Development to coordinate programs through which the rural poor could be assisted. A pilot program was established in selected counties and small amounts of funds were appropriated; no large-scale funding occurred until the Area Redevelopment Act of 1961.

- President Kennedy, in his long-range farm program plan outlined in a special message to Congress in March 1961, sought more aid to areas of rural poverty through a rural area Redevelopment Program that would expand credit for farm facilities and rural housing. P.L. 87-2, the Area Redevelopment Act, was signed May 1, 1962. The Act authorized Federal loans and grants for the redevelopment of areas of chronic unemployment.
- In September 1962, P.L. 87-703, the Food and Agriculture Act of 1962, was enacted. A new program of Federal technical aid and 30-year loans to local governments for projects aimed at making depressed rural areas attractive for investment was included in the Act. The rural renewal projects could include the building of roads and community buildings. The Federal government would assume half the costs of developing recreational facilities at small watershed projects and make loan repayments for the construction of extra reservoir capacity designed to meet future municipal and industrial needs. The loans would be made only after a state agency having supervisory control over rural renewal or community development plans, or the Governor, approved them.
- On January 31, 1964, President Johnson sent Congress his first message on agriculture. One of his goals was to accelerate the development and conservation of material and human resources in rural America, where one-third of the citizens live. The President's message laid particular stress on problems of rural impoverishment and promised a variety of legislation to "assist rural America to realize the promise of its potential".
- A concerted attack on poverty in the U.S. -- both urban and rural -- was the aim of President Johnson's anti-poverty bill, signed into law August 20 as the Economic Opportunity Act of 1964 (P.L. 88-452). The objective was to provide loans to rural areas for improving the economic viability of agricultural and other rural enterprises, and thus help boost rural income and living standards. Administration of the program was delegated to the Farmers Home Administration. The anti-poverty bill was one of the most important steps taken to deal with poverty and the effects on low income families in rural areas.

- President Johnson, in his 1965 Budget Message, called for legislation that would provide Federal and regional coordination of plans for water resource development. P.L. 89-80, called the Water Resources Planning Act, established the Water Resources Council. The Council, composed of the Secretaries of Interior, Agriculture, Army, HEW, and the Chairman of the Federal Power Commission, was to evaluate regional and river basin plans in relation to water needs, and coordinate the administration of Federal water programs.
- The Omnibus Housing and Urban Development Act of 1968 (P.L. 90-448) included some of the rural housing and rural planning authorizations that President Johnson had been seeking for a number of years.
- President Nixon signed the Rural Development Act on August 30, 1972. The Act provided for expansion of various existing programs and authorized numerous new programs. The Act authorized the Farmers Home Administration to grant loans for community facilities such as firehouses and community facilities. Title I of P.L. 92-419 also established planning guidelines for grants, to require: 1) that proposed projects serve areas not likely to decline in population; 2) were adequate to meet growth; and 3) were consistent with community development and multi-jurisdictional plans. Title II of the law authorized grants up to $10 million annually for the preparation of comprehensive rural development plans.

9. Type of Federal grant or loan mechanism.

   - Guaranteed loans are granted to public and quasi-public bodies unable to finance the proposed project from its own resources or through commercial credit at reasonable rates and terms.

10. Type of recipient.

    - Public and quasi-public bodies and associations including nonprofit organizations and Indian tribes on Federal and/or state reservations. These bodies must serve residents of open country and/or rural towns and villages of less than 10,000 population.

11. Eligibility and application requirements for state and/or locality to receive Federal funds.

    - Applications for Farmers Home Administration assistance are made at the county office serving the area in which the project will be located. The county supervisor investigates the application, verifies the information contained in the application, and determines whether the applicant is eligible for assistance.

The county supervisor provides applicants with technical guidance; the extent of guidance is determined by the applicant's problems and needs. The state office insures that the legislative requirements are carried out.

- Applicants must certify that they are unable to obtain sufficient credit elsewhere at reasonable rates and terms. Farmers Home Administration requires its state office to determine the availability of alternative credit sources for each applicant, and to request those applicants for which alternative credit appears available, to apply for such credit. Those applicants who are requested to seek credit elsewhere must provide the Administrator with evidence that credit elsewhere is not available before the Farmers Home Administration will continue to process the loan request. The Farmers Home Administration direct and insured loan program differs from the usual government insured loan program: the Administration handles all details of making the loans, including locating funds, processing applications, supervising borrowers' operations and servicing accounts. The only significant difference between direct loans and insured loans is that funds for direct loans are obtained from the Treasury and funds obtained for insured loans are obtained from private sources.

12. Federal funds allotment procedure.

    - Formula allocation to states.

13. Factors used in determining the Federal allotment.

    - The Community Facilities Loan Program allocates funds in the same way as it does Water and Waste Disposal Loans. A review of the description given in that section is advised.
    - The Farmers Home Administration is concluding a survey of community facilities in rural areas. The survey is to inventory present facilities and to identify additional need for such facilities. The identification of need on a state-by-state basis could be used for overall program management and would provide necessary information for allocating available funds if specific priorities have been identified.

14. Agency or Congressional rationale for using this procedure and variables.

    - The Consolidated Farm and Rural Development Act authorizes the Secretary of Agriculture to make loans and grants to finance the improvement or construction of projects in rural areas to serve farmers and rural residents. The Act defines rural area as any area that has a population of less than 10,000. The Act requires that the highest priority be given the rural communities with a population of less than 5,500.

15. Degree to which states and localities influence project selection.

- The state offices are responsible for administering all Farmers Home Administration programs and activities and for supervising county operations. State offices provide program supervision and management assistance to the county offices. The county offices make and service loans and grants at the local level and provide technical guidance to the borrowers.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- The components of needs assessment are clearly stated in the authorizing legislation and used by Farmers Home Administration in the allocation process.

B. Is NA a precondition for grant, loan or direct Federal expenditure?

- Yes. However, the needs assessment criteria used in distributing monies state-by-state are different from the needs information that the applicant provides to the state office. That is, the proportion of rural population and poverty households in a state determines a state's allocation of total funds, while financial need of an applicant determines the distribution of funds within a state.

C. Does program provide additional grant-in-aid for conducting the NA?

- Not directly, but the Farmers Home Administration operating budget provides for a Planning and Technical Assistance staff to help states and localities assess needs.

D. Who conducts the NA?

- The applicant, with the assistance of the county office of the Farmers Home Administration, completes and files a form that clearly states his financial need. The needs assessment (see Section 13) is conducted by the national office on a state-by-state basis.

E. In what type of document is the NA contained?

- Project application.

F. How is need defined?

- Traditionally, the applicant defines his need in terms of his financial situation. Evidence that the applicant has sought credit elsewhere must be presented to Farmers Home Administration officials.

G. What technique is to be used for conduting the NA. i.e., measuring the need?

- Not applicable.

H. What are the key factors (variables) to be considered in doing the NA?

- That a rural community be financially needy, as shown to the county and state officials by way of evidence (e.g., the applicant's bonds were offered on the open market and did not sell).

I. With what frequency is the NA to be performed?

- Project-by-project basis.

17. Strengths and weaknesses.

- The General Accounting Office has repeatedly criticized the Farmers Home Administration for failing to allocate funds on the basis of each state's individual needs. Currently, the Farmers Home Administration is concluding a survey of all community facilities in rural areas. It is believed that this survey will be useful in overall program management and will provide necessary information for allocating available funds once local priorities have been identified. When the survey is concluded, needs for community services like fire department service, ambulance service and hospitals will be assessed by planning standards. The needs assessment will help the Administration determine relative need for community facilities by both type of facility and geographic area. Moreover, the data will help decision-makers at the national, state, and local level allocate funds and evaluate programs. Comparative assessments among functional areas will also be possible.

18. Information on Federal funding for the PWI program.

- One of the bases for amounts requested by FmHA is the number of loan and grant/loan applications received yearly. Over time, the FmHA has developed a data base which allows it to assign an average value to each application. The dollar value of each application multiplied by the projected number of applications to be submitted provides an estimate to request.

- The FmHA allocation process is the first phase for distributing appropriated monies. The second phase occurs twice during a fiscal year when the national office pools unobligated loan funds. These funds are added to the national office reserve fund to be used for subsequent allocations. This is a means of using all available funds and of reallocating them to areas for immediate use.
- Data on community facility loans obligated by states, from 1974 to 1977, are contained in Exhibit A.1 (attached).

19. Primary data sources for completing summary sheet.

- Congress and the Nation, Volumes I through IV.
- Farmers Home Administration, Use of Resources Report, September, 1976.
- Farmers Home Administration, Community Program Statistics, January, 1978.
- GAO Reports.
  - Audit of the Farmers Home Administration, August, 1958.
  - Financial Feasibility of Rural Water and Sewer Systems, April, 1971.
  - The Farmers Home Administration's Water and Waste Disposal Program, September, 1977.
  - Management of the Farmers Home Administration Water and Waste Disposal Program, March 1978.

Exhibit A.1: Community Facility Loans

UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

COMMUNITY FACILITY LOANS: LOANS OBLIGATED BY STATES, FISCAL YEARS 1974-1975

STATE	1974 INITIAL NUMBER	1974 INITIAL AMOUNT DOL.	1974 TOTAL NUMBER	1974 TOTAL AMOUNT DOL.	1975 INITIAL NUMBER	1975 INITIAL AMOUNT DOL.	1975 TOTAL NUMBER	1975 TOTAL AMOUNT DOL.
U.S. TOTAL	96	48.726.700	102	49.830.700	306	183.434.700	359	199.998.000
ALABAMA	---	---	---	---	8	4.520.000	8	4.520.000
ALASKA	---	---	---	---	---	---	1	1.000.000
ARIZONA	2	445.000	2	445.000	4	973.300	7	1.777.700
ARKANSAS	---	---	---	---	6	7.995.000	7	8.195.000
CALIFORNIA	---	---	---	---	5	3.360.000	6	3.380.000
COLORADO	1	2.053.000	1	2.053.000	3	965.000	3	965.000
CONN.	---	---	---	---	2	570.000	3	1.020.000
DELAWARE	1	400.000	1	400.000	1	49.900	1	49.900
FLORIDA	---	---	---	---	5	1.219.000	5	1.219.000
GEORGIA	---	---	---	---	2	8.265.000	2	8.265.000
IDAHO	6	652.400	6	652.400	1	42.000	3	201.900
ILLINOIS	---	---	---	---	5	10.150.000	5	10.150.000
INDIANA	1	20.000	1	20.000	6	7.401.000	6	7.401.000
IOWA	1	600.000	1	600.000	4	1.468.000	5	1.708.000
KANSAS	---	---	---	---	1	55.000	1	55.000
KENTUCKY	---	---	---	---	3	1.724.400	3	1.724.400
LOUISIANA	---	---	---	---	5	5.157.000	5	5.157.000
MAINE	9	5.283.000	9	5.283.000	11	8.142.000	12	8.242.000
MARYLAND	---	---	---	---	2	1.175.000	2	1.175.000
MASS.	3	3.342.000	3	3.342.000	7	1.862.200	8	1.907.200
MICHIGAN	5	1.775.000	5	1.775.000	10	7.175.400	14	7.971.400
MINNESOTA	4	913.000	4	913.000	9	4.017.000	13	4.414.000
MISS.	---	---	---	---	5	1.141.000	7	4.165.200
MISSOURI	---	---	---	---	1	43.500	1	43.500
MONTANA	---	---	---	---	5	196.000	5	196.000
NEBRASKA	---	---	---	---	1	650.000	1	650.000
N.H.	---	---	2	515.000	4	1.365.000	4	1.365.000
NEW JERSEY	1	4.000.000	1	4.000.000	9	18.805.000	9	18.805.000
NEW MEXICO	---	---	1	42.000	1	300.000	3	451.000
NEW YORK	3	1.013.200	4	1.250.200	31	9.169.500	34	9.579.500
N.C.	20	3.268.000	20	3.268.000	62	13.550.100	62	13.550.100
N. DAKOTA	2	75.000	2	75.000	9	2.298.000	10	2.314.000
OHIO	4	1.336.000	4	1.336.000	4	1.268.000	6	2.518.000
OKLAHOMA	3	3.650.000	3	3.650.000	2	2.400.000	4	2.532.000
OREGON	2	1.508.200	2	1.508.200	2	1.720.000	2	1.720.000
PENN.	6	11.845.000	6	11.845.000	10	8.852.400	16	12.139.700
R.I.	---	---	---	---	1	30.000	1	30.000
S.C.	3	723.200	4	1.008.200	8	3.109.000	13	4.061.000
S. DAKOTA	---	---	---	---	3	1.741.000	4	1.821.000
TENNESSEE	7	1.855.000	7	1.855.000	21	6.457.300	25	7.380.800
TEXAS	1	85.000	1	85.000	4	1.216.000	4	1.216.000
VERMONT	2	515.000	2	515.000	9	1.371.600	10	1.391.600
VIRGINIA	4	1.366.000	5	1.391.000	10	11.484.100	10	11.484.100
WASHINGTON	---	---	---	---	1	706.000	1	706.000
W.VIRGINIA	---	---	---	---	1	18.000.000	1	18.000.000
WISCONSIN	5	2.003.700	5	2.003.700	1	1.238.000	4	3.233.000
WYOMING	---	---	---	---	1	57.000	1	57.000
P. RICO	---	---	---	---	---	---	1	90.000

Exhibit A.1: Community Facility Loans (continued)

UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

COMMUNITY FACILITY LOANS: LOANS OBLIGATED BY STATES, FISCAL YEARS 1976-1977

STATE	1976 & TQ INITIAL NUMBER	1976 & TQ INITIAL AMOUNT	1976 & TQ TOTAL NUMBER	1976 & TQ TOTAL AMOUNT	1977 INITIAL NUMBER	1977 INITIAL AMOUNT	1977 TOTAL NUMBER	1977 TOTAL AMOUNT
U. S. TOTAL	402	225,613,000	485	249,995,600	302	165,152,100	382	199,980,800
ALABAMA	7	2,178,500	12	7,269,700	10	7,173,500	11	7,473,500
ALASKA	0	0	1	400,000	1	260,000	1	260,000
ARIZONA	9	3,239,000	10	3,589,000	3	1,185,000	3	1,185,000
ARKANSAS	4	2,950,000	5	3,275,000	7	3,805,000	10	7,705,000
CALIFORNIA	11	7,363,000	13	7,416,000	5	4,797,000	6	5,092,000
COLORADO	3	5,815,000	4	5,965,000	1	775,000	2	1,500,000
CONNECTICUT	7	2,067,400	8	2,087,400	4	319,100	5	405,100
DELAWARE	1	154,900	1	154,900	2	630,000	2	630,000
FLORIDA	6	4,913,000	6	4,913,000	2	1,479,000	3	1,798,000
GEORGIA	5	1,905,000	5	1,905,000	5	7,116,000	5	7,116,000
HAWAII	0	0	0	0	0	0	0	0
IDAHO	2	1,127,000	4	1,207,000	0	0	1	165,000
ILLINOIS	6	5,196,000	9	6,029,800	3	1,147,000	3	1,147,000
INDIANA	10	7,207,900	13	8,232,900	8	5,047,800	9	5,367,800
IOWA	7	2,165,000	9	2,255,000	9	8,524,000	9	8,524,000
KANSAS	0	0	0	0	1	24,000	1	24,000
KENTUCKY	7	7,877,000	7	7,877,000	4	4,659,000	6	6,659,000
LOUISIANA	3	1,180,000	3	1,180,000	3	7,265,800	3	7,265,800
MAINE	15	6,472,000	20	9,002,000	13	4,223,500	18	6,532,500
MARYLAND	3	1,387,600	3	1,387,600	7	2,329,000	7	2,329,000
MASSACHUSETTS	2	1,037,000	3	1,168,400	1	1,300,000	1	1,300,000
MICHIGAN	11	11,302,000	12	11,337,000	4	4,200,000	8	7,692,000
MINNESOTA	13	4,836,000	18	5,876,000	17	10,920,600	25	11,971,400
MISSISSIPPI	13	6,354,000	16	6,754,000	5	4,212,000	6	4,512,000
MISSOURI	3	5,185,900	6	5,507,200	2	2,203,500	3	2,353,500
MONTANA	3	5,538,000	3	5,538,000	3	2,558,700	3	2,558,700
NEBRASKA	2	850,000	2	850,000	1	115,000	2	167,000
NEVADA	1	55,300	1	55,300	0	0	0	0
NEW HAMPSHIRE	2	960,000	2	960,000	2	288,000	2	288,000
NEW JERSEY	8	12,067,000	9	13,067,000	3	4,520,000	5	6,320,000
NEW MEXICO	1	1,800,000	1	1,800,000	3	1,248,000	3	1,248,000
NEW YORK	27	10,434,300	30	10,705,300	26	5,767,800	27	5,897,800
NORTH CAROLINA	91	18,876,000	95	18,952,200	55	6,681,800	63	11,127,400
NORTH DAKOTA	8	1,752,000	10	1,777,000	4	1,119,000	5	1,139,000
OHIO	6	7,864,600	11	8,601,600	4	3,156,000	6	4,359,400
OKLAHOMA	6	3,936,700	7	4,186,700	3	2,194,200	7	3,164,700
OREGON	4	1,953,000	6	2,448,000	2	109,000	3	1,043,000
PENNSYLVANIA	6	14,655,300	9	17,923,500	10	9,572,100	11	10,332,100
RHODE ISLAND	1	45,000	1	45,000	1	160,000	2	225,000
SOUTH CAROLINA	16	5,681,100	20	6,206,100	9	2,755,700	14	3,890,700
SOUTH DAKOTA	4	1,182,000	6	1,385,000	4	2,063,500	7	2,148,500
TENNESSEE	27	6,493,000	36	9,947,300	22	8,379,000	33	9,900,900
TEXAS	17	12,348,700	19	12,478,700	11	9,714,000	14	11,473,000
UTAH	1	15,000	1	15,000	0	0	0	0
VERMONT	7	853,700	7	853,700	5	1,930,000	7	2,042,500
VIRGINIA	3	7,040,600	5	7,722,500	3	5,628,500	3	5,628,500
WASHINGTON	1	2,230,000	1	2,230,000	0	0	1	1,907,000
WEST VIRGINIA	3	4,941,000	3	4,941,000	4	6,233,000	4	6,233,000
WISCONSIN	4	5,728,000	7	5,920,300	6	4,450,000	7	4,518,000
WYOMING	3	3,197,500	3	3,197,500	2	435,000	2	435,000
PUERTO RICO	2	3,400,000	2	3,400,000	2	2,478,000	3	5,935,000

Economic Development Grants and Loans for Public Works and Development Facilities/Economic Development Administration, U.S. Department of Commerce

1. PWI functional areas addressed in this study.

   - Water and sewer systems.
   - Industrial parks; port/harbor facilities; educational facilities; general industrial/commercial facilities; recreation/tourism facilities.

2. Conceptual category of need satisfied by this PWI program.

   - Encourage economic development (primary).
   - Countercyclical measures.

3. Type of Federal program.

   - Mostly grants, some loans.

4. Authorizing legislation.

   - P.L. 89-136 (42 U.S.C. 3131 et seq.)

5. Implementing rules and regulations.

   - 13 CFR Chapter III.
   - "Guides for Overall Economic Development Programs".

6. Program objectives.

   - Qualified projects should 1) improve the opportunities for the successful establishment or expansion of industrial or commercial plants or facilities, 2) assist in the creation of additional long-term employment opportunities, and 3) benefit the long-term unemployed or members of the low income families.

7. Program scope.

   - New construction or renovation which alleviate conditions of substantial and persistent unemployment in economically distressed areas, or aid the economic development of areas and regions experiencing long-term economic deterioration.

8. Year program was initiated and years when major changes were made.

   - Though the Economic Development Administration was established in 1965, it in part constituted a reenactment of the Kennedy Administration's 1961 Area Redevelopment Act, which expired in 1965. The provisions for public works construction in

depressed areas were borrowed from the 1962 Public Works Acceleration Act, and the stress on regional/multi-county economic planning followed a pattern set by the Appalachian Aid Bill (P.L. 90-103) passed earlier in 1965.

- During his first term, President Nixon resisted Congressional efforts to refocus the regional development programs from long-term rural economic improvement toward more widespread unemployment problems caused by general economic conditions. He vetoed such expanded legislation in 1971 and 1972, so Congress extended the original programs.
- In addition to extending EDA through June 30, 1973, and 1971 amendments required that 25 to 35 percent of all EDA public works grants be invested in special areas with 1) large concentrations of low-income persons; 2) substantial out-migration; 3) substantial unemployment, or 4)actual or threatened abrupt rise of unemployment. These areas were not required to show evidence of local planning. Projects in these areas (public works impact projects) were to provide immediate useful work and could receive 100 percent grants if the local or state government could not match the grant.
- In 1973, the President proposed abolishing EDA, integrating its programs into other Federal programs involved with rural development, and ending direct Federal contributions to the seven regional bodies funded under the 1965 Act. In 1974, Congress again ignored proposals to abolish the existing economic development programs. Congress did reduce the amount of special public works investment required by the 1971 amendments. The reduction was from 25 percent to 10 percent. Congress extended EDA two years, through fiscal year 1976.
- In 1976, Congress extended the 1965 Act for three years, through fiscal year 1979, while increasing EDA annual authorizations and revising eligiblity standards to benefit urban areas as well as rural.
- Experience gained in helping areas of the nation with problems of long-term unemployment enabled EDA to play a significant role in carrying out the requirements of the Public Works Employment Act of 1977. Also in 1977, EDA was given total responsibility for approving loans and grants for 268 drought relief projects, caused by the prolonged drought of 1976 and 1977 in the western and plains states.

9. Type of Federal grant or loan mechanism.

- Project grants.

10. Type of recipient.

- Cities, towns, counties, states, Indian tribes and communities.

11. Eligibility and application requirements for state and/or locality to receive Federal funds.

- To qualify for the basic forms of EDA assistance, an area must meet one of the requirements set forth in Title IV of the Act. Among the qualification requirements are: 1) at least six percent unemployment for a specified time period; 2) median family income fifty percent or less of the national average; 3) an unusual or abrupt rise in unemployment; 4) a significant decline in per capita employment over a 10-year period; and 5) long-term economic deterioration.
- After an area qualifies, it must submit an overall economic development program to EDA in order to be designated a redevelopment area, eligible for EDA program assistance. To be eligible for assistance, a project must be located in: 1) an area designated by the Secretary of Commerce as a redevelopment area, or 2) a designated economic development district (which may comprise multistate areas). The area's program must identify projects for promoting economic progress and improving community facilities and services. Prospective applicants prepare applications for grants for public works projects with the assistance of economic development specialists at EDA regional offices. The applications are submitted to EDA regional offices where they are reviewed and evaluated to determine whether the proposed projects meet the objectives and requirements of the Act and other EDA criteria. The regional offices transmit the applications to EDA headquarters with project evaluations which include recommendations for approval or disapproval.

12. Federal funds allotment procedures.

- Through fiscal year 1978, all EDA funds were allocated on the basis of discretionary funding to the applicant. Beginning with fiscal year 1979, EDA decided that allocations should be made to its six regions, by budget category (Public Works, Tecnical Asistance, etc.). Regional allocations would be determined on the basis of unemployment, low income, number of units served, historic funding, and distressed areas.

13. Factors used in determining the Federal allotment.

- The factors generally used for both qualification as an economic development area as well as project prioritization are population loss, median family income, per capita employment, plus the duration and severity of economic distress. EDA considers duration and severity of economic distress as being indicated by the high average annual unemployment in the last calendar year, and the average annual unemployment over the last four years. By way of judgment, EDA gives the following factors special consideration when

ranking projects: 1) the long term benefits of the project; 2) the labor intensity of the project; and 3) whether the project is sponsored by a local government unit and is related to an existing community plan. Generally, it must be noted that project ranking has, for the most part, been subjective, only becoming weighted with the implementation of the local public works program in 1977.

14. Agency or Congressional rationale for using this procedure and variables.

- Section 101 of the Act, which authorizes direct grant by EDA of up to 50 percent of the cost of a project, also authorizes supplementary grants up to 80 percent to help those states and localities that may have difficulty raising matching funds. EDA, pursuant to this provision, has established a schedule of maximum grant rates which reflect the relative needs. In establishing grant rates above 50 percent on the basis of the prior year unemployment rate, EDA uses the following criteria:

Unemployment Rate	Maximum Grant Rate
8.0 to 9.9 percent	60%
10.0 to 11.9 percent	70%
12.0 or higher percent	80%

For designated Indian Tribal areas, the maximum grant rate is 100 percent.

- Section 401 of the Act provides criteria by which economic distress shall be measured, namely, population loss due to lack of employment opportunity, sudden rise in unemployment, low income, and Indian land.
- Section 402 of the Act requires the Secretary to conduct an annual review of all areas designated as redevelopment areas, and to terminate or modify the designations of areas on the basis of this review.
- EDA's rules and regulations governing the allocation of funds and selection of projects has consistently reflected the intention of Congress.

15. Degree to which states and localities influence project selection.

- In fiscal year 1979, EDA formalized a means by which the Overall Economic Development Program (OEDP), the plan which sets forth the long term economic development goals of an area, is linked to the EDA Project-specific investment. Increasingly, an area's development of its investment strategy within the context of its OEDP will enable that area to identify the local capacity and resources available to

achieve the OEDP's economic development goals. As a result of this new approach, a community will submit its investment strategy to the regional EDA director, who will forward that document to Washington for review. EDA believes that this is an improvement over its historical approach to alleviating economic distress, namely, a project-by-project approach. In part, it credits the recommendations of the White House Conference on Balanced National Growth and Economic Development with spawning this approach to leveraging and linking limited resources to local economic development.

- The respondent to the 1975 Advisory Commission in Intergovernmental Relations' questionnaire, the Administrator of the Grants and Loans Program, suggested that the national office consult more closely with localities when preparing or reissuing regulations and guidelines. Moreover, he indicated that modest improvements could be made by the localities in coordinating grant-aided activities with other state and local projects.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws, in the rules and regulations.

- An area receiving EDA grant assistance must have an approved overall economic development program (OEDP) and the project for which financial assistance is sought must be consistent with that program. Through the investment strategy approval program, begun in FY1979, the needs assessment requirements have been made more explicit.

B. Is NA a precondition for grant, loan or direct Federal expenditure?

- Yes.

C. Does program provide additional grants-in-aid for conducting the NA?

- Yes.

D. Who conducts the NA?

- The areas designated as redevelopment areas, groups of adjoining counties and/or Indian reservations determined by the Secretary of Commerce as having a substantial need for planning assistance. These are areas or regions having substantial or persistent unemployment.

E. In what type of document is the NA contained?

- The Overall Economic Development Program and investment strategy (action plan), covering a minimum period of two years, are submitted annually by the applicant described above.

F. How is need defined?

- Income and unemployment.

G. What technique is to be used for conducting the NA, i.e., measuring the need?

- Planning standards.

H. What are the key factors (variables) to be considered in doing the NA?

- Population loss (out migration).
- Median family income.
- Per capita employment.
- Average annual unemployment.
- Long term economic deterioration.

I. With what frequency is the NA to be performed?

- Annually.

17. Strengths and Weaknesses.

- EDA's ability to properly identify areas of the country eligible for EDA assistance hinges on the soundness of the unemployment and income data. Substantial improvements are needed in these data for local areas. (Source: GAO)
- Traditionally, appropriations acts provide that program funds be expended only in the fiscal year for which they are authorized. EDA can terminate grant agreements when delays occur, though millions of dollars in public works grants are generally not disbursed in the year of the original obligation. To the extent that members of Congress are concerned about the timeliness of getting approved projects under construction, this inequity, which precludes the funding of other ready projects, should be rectified. The longer it takes to get a project under construction, the longer it takes to create employment opportunties. (Source: GAO)

18. Information on Federal funding for the PWI program.

- Based on EDA data, slightly more than half of the authorizations since FY 1966 were actually appropriated.

19. Primary data sources for completing summary sheet.

- Congress and the Nation, Volumes I through IV.
- Public Works and Unemployment: A History of Federally Funded Programs.
- Area Redevelopment Administration.
- Annual Reports of the Economic Development Administration 1967-1977.
- EDA Internal Documents.
  - FY 1974 Assessment of Needs for Economic Development Assistance.
  - Bulletins Concerning the Comprehensive Economic Development Strategy, 1978.
  - Preliminary Report on EDA's Operational Planning and Control System, June 1978.
- GAO Reports.
  - CED-77-86, July 7, 1977, Expediting Economic Development and Job Opportunities.
  - B-153449, February 4, 1969, Improving Supplementary Grant Assistance for Public Works and Development Facility Projects.
  - B-133182, May 10, 1971, More Reliable Data Needed for Assisting Economically Distressed Areas.
  - B-153449, March 21, 1972, More Effective Use Could Be Made of Program Resources to Alleviate Unemployment.
- Breckenridge, Charlotte, Eligibility Criteria for EDA, Title IV: An Examination, prepared for the use of the Senate Subcommittee on Regional and Community Development, Congressional Research Service, December 6, 1978.

Community Development Block Grants, Entitlement Grants/
Community Planning and Development, Department of Housing
and Urban Development

1. PWI functional areas addressed in this study.

   - Neighborhood facilities.
   - Basic water supply and distribution.
   - Sewer lines.

2. Conceptual category of need satisfied by the PWI program.

   - Encourage economic development (primary).
   - Improve quality of life.

3. Type of Federal program.

   - Federal grants-in-aid (entitlements and formula grants).
   - Discretionary grants (small cities and project grants).

4. Authorizing legislation.

   - P.L. 93-383 (42 U.S.C. 5301-17).

5. Implementing rules and regulations.

   - 24 CFR 570, Administrative Guidelines for Community Development Block Grants.

6. Program objectives.

   - To assist communities in providing decent housing, a suitable living environment, and expanded economic opportunities, principally for persons of low and moderate income. To create viable urban communities,where decisions are made by the local residents and the performance of local government is improved.

7. Program scope.

   - Acquisition and construction of certain public works facilities, and improvements. Additionally, economic development activities. Funds are not to be used for constructing or rehabilitating public facilities for the general conduct of government or for such community-wide facilities as sports arenas, libraries, or cultural centers.

8. Year program was initiated and years when major changes were made.

- The Community Facilities Administration was established in 1954 by the Housing and Home Finance Agency (created in 1947 under Reorganization Plan Number 3) to provide financing for construction of community facilities such as sewer and water distribution systems, and for public works planning. CFA could either purchase securities of local communities or make loans to them. In 1962, by way of the Public Works Acceleration Act, CFA was permitted to make grants as well as loans. Public works planning advances were financed by a revolving fund.
- From 1961 to 1964, both Presidents Kennedy and Johnson had unsuccessfully proposed creation of a housing department. Title VII of the 1965 Housing Act not only authorized a new program of matching grants to local public bodies for the construction of basic public water and sewer facilities, but also authorized grants for up to two-thirds of the cost of constructing neighborhood facilities. HUD was given all the powers, functions, and duties of the HHFA.
- Title II of the Demonstration Cities and Metropolitan Development Act of 1966 (P.L. 89-754) required local officials to submit for review to an areawide planning agency all applications for water development and construction projects. Unlike the urban renewal emphasis on physical planning on a project-by-project basis, the model cities program required comprehensive planning that combined physical, social, and economic planning. Further, because of the broader scope of the model cities activities, planning became more prominent; the Department provided participants with a full year's funding for planning prior to program start-up.
- In 1971, President Nixon sought to consolidate the HUD community development grant and loan programs into a Department of Community Development. The proposed legislation would have provided automatic grants for community development purposes based upon population, poverty figures and the extent of housing overcrowding.
- The 1974 Housing and Community Development Act (P.L.93-383) consolidated ten categorical urban aid programs into a system providing block grants to cities of at least 50,000. The amount of the grant was based on a three part formula reflecting a community's population, poverty and housing needs. Title I of the bill instructed communities to give top priority to activities helping the poor and eliminating blight. The bill provided for a six year phase-in period if the shift to the formula reduced a city's previous funding under the categorical programs (so called "hold harmless"). Plans outlining community needs and program implementation were required. Grants were to be used for construction and improvement of public works facilities, neighborhood facilities, water and sewer facilities, flood and drainage facilities and solid waste disposal.

9. Type of Federal grant or loan mechanism.

- Formula grant.
- Project grant.

10. Type of recipient.

- City .
- Locality.
- Over time, more discretionary (project) funds will be available for communities under 50,000 population.

11. Eligibility and application requirements for state and/or locality to receive Federal funds.

- Entitlement/Formula Grant.
  - Localities file annual applications to HUD area offices. Applications must contain: 1) a summary of the three-year community development plan, 2) a one-year community development program, and 3) a budget. There is no matching requirement. Activities need not be completed in the fiscal year.
- Small Cities Discretionary Grant.
  - All counties and units of general local goverment may apply to a HUD area office. Assistance is for an annual program and there are no automatic renewals though activities may be continued beyond one year, until completed.

12. Federal funds allotment procedures.

- Formula approach to states and localities.
- Discretionary funding to projects in states and localities.

13. Factors used in determining the Federal allotment.

- Population, poverty figures (weighted double) and extent of housing overcrowding. While in transition to a full entitlement program, guarantees no major drop in funding for cities that had participated in categorical urban aid programs in the past.

14. Agency or Congressional rationale for using this procedure and variables.

- Offers local government flexibility within guidelines (e.g., three year plan and types of construction).
- Delivers money more fairly than the categorical grant program.
- Simplifies Federal grant-making.

15. Degree to which states and localities influence project selection.

- Involvement is required by the three year development plan and one year implementation program.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- The CDBG formula is the joint product of HUD, the Congress, and OMB. The development of the formula began about January 1971 and continued until the community development legislation was enacted in August 1974. The three variables included in the formula represent a "need" of the applicant to receive CDBG funds.

B. Is NA a precondition for grant, loan or direct Federal expenditures?

- The 1974 law requires that all communities applying for community development funds submit an appliation 1) identifying community development needs, 2) formulating a program to meet needs, 3) showing conformance with civil rights acts, and 4) carrying assurances that citizens had the opportunity to participate in the formulation of the application. Similarly, cities and urban counties receiving automatic entitlements must outline a three year plan of anticipated activities.

C. Does program provide <u>additional</u> grant-in-aid for conducting the NA?

- Title IV authorizes additional comprehensive planning grants.

D. Who conducts the NA?

- Local and regional general government bodies.

E. In what type of document is the NA contained?

- In large part, it depends upon the integrative relationships of the units of government. Both the 1954 and 1966 Acts promoted coordination along geographic lines, in an effort to foster broad-based awareness of the local impact of programs. These efforts were buttressed by Title IV of the Intergovernmental Cooperation Act of 1968. Needs must be assessed by the applying locality.

F. How is need defined?

- Benefits provided to low- or moderate-income families, or
- Aiding the prevention or elimination of slums/urban blight.

G. What technique is to be used for conducting the NA, i.e., measuring the need?

- Planning standards approach.

H. What are the key factors (variables) to be considered in doing the NA?

- Population.
- Overcrowded housing.
- Poverty.

I. With what frequency is the NA to be performed?

- The program is to be updated by the applicant annually, while the Plan, which most closely approximates a needs assessment in this case, is to be revised every three years.

17. Strengths and weaknesses.

- HUD headquarters develops overall guidelines and criteria for awarding discretionary grants and allows regional offices to use those criteria to establish their own rating systems.
- Under the Small Cities Program, however, HUD headquarters establishes a national rating system to be used for all area offices.
- The allocation formula does not recognize differences in cost-of-living among regions and areas in determining poverty levels, even though it is mandated by Section 102(a)(8) of the 1974 Act.
- The issue of the proper allocation of CDBG funds among cities has been one of the most important and controversial ones facing the program. Under the old categorical system displaced by CDBG, funds were distributed on a competitive, case-by-case basis. The 1974 Act, however, established a formula based on population, poverty, and housing overcrowding for distributing community development funds among jurisdictions. HUD and the Brookings Institution made extensive studies of the 1974 formula arrangements. The HUD study (Bunce, 1976) found the 1974 formula to be highly responsive to the poverty dimension of community development need, but unresponsive to non-poverty dimensions. The study showed that cities losing population exhibited far higher levels of community development need and fiscal strain than fast-growing cities. The

Brookings study (Nathan, et al., 1977) judged that the major flaw of the 1974 formula was its unresponsiveness to the severe physical, social, and fiscal problems of older deteriorating metropolitan cities. In 1977, Congress replaced the single 1974 formula with a dual formula which included the 1974 formula and added a second formula based on age of housing, poverty, and below-average population growth. The 1977 formula is based on poverty (weighted 30 percent), pre-1940 housing (weighted 50 percent), and growth lag (weighted 20 percent).

18. Information on Federal funding for the PWI program.

- During the Johnson Administration, major housing bills were introduced and approved by the Congress. These bills' passage was a reaction to the crisis that was developing in the nation's deteriorating cities.
- During 1969 and 1970, Congress increased authorizations for the seven grant programs for community development. Large increases for the water and sewer grant program were authorized by the 1970 Emergency Community Facilities Act. It was not until Congress enacted the Community Development Block Grant program in 1974 that the Administration's moratorium on all new commitments under existing Federal housing was lifted. The 1974 Act chartered an entirely new course for the nation's housing and urban aid programs.
- During the Johnson Administration, Congress consistently refused to fund certain major programs, at anywhere near the maximum levels authorized in the basic laws.
- During the Nixon Administration, most housing programs were extended and funding levels kept constant, in order to allow a complete executive review of housing and urban development programs and so that Congress could achieve administrative changes to rectify problems in the subsidized and public housing programs.

19. Primary data sources for completing summary sheet.

- Congress and the Nation, Volumes I through IV.
- Block Grants for Community Development, HUD, January 1977.
- Community Development Block Grant Program, Annual Report, HUD.
- Housing and Urban Development, Code of Federal Regulations, revised as of April 1, 1976.
- Interviews.
- GAO Reports.
  - Domestic Housing and Community Development (CED-77-102).
  - The Community Development Block Grant Program (CED-78-157).
  - Why Formula Should be Improved (CED-77-2).
- Bunce, Harold, An Evaluation of the Community Development Block Grant Formula, HUD, December 1976.
- Nathan, Richard, et al., Block Grants for Community Development, The Brookings Institute, January 1977.

HEALTH AND EDUCATION PROGRAMS

Construction of School Facilities in Federally Affected Areas/Office of Education, DHEW

1. PWI functional area addressed in this study.

   - Elementary and secondary education.

2. Conceptual category of need satisfied by this PWI program.

   - Equity considerations.
   - Improve quality of life.

3. Type of Federal program.

   - Federal grant-in-aid (with limitations on total payments).
   - Direct Federal expenditure (for Section 10 programs only).

4. Authorizing legislation.

   - P.L. 81-815 (1950).
   - P.L. 83-246 (1953).
   - P.L. 85-620 (1958).
   - P.L. 89-313 (1965).
   - P.L. 89-750 (1966).
   - P.L. 90-247 (1967).
   - P.L. 91-230 (1970).
   - P.L. 93-380 (1974).

5. Implementing rules and regulations.

   - 45 CFR 112, "School Construction Assistance in Cases of Certain Disasters".
   - 45 CFR 114, "Assistance for School Construction in Areas Affected by Federal Activities".

6. Program objectives.

   - To provide assistance for the construction of urgently needed minimum school facilities in school districts which have had substantial increases in school membership as a result of new or increased Federal activities.
     - Section 5(a)(1) initially pertained to children whose parents lived and worked on Federal property; now pertains to children who reside on Federal property.
     - Section 5(a)(2) initially pertained to children whose parents lived or worked on Federal property; now pertains to children whose parents are employed on Federal property or whose parent(s) is (are) on active duty in the uniformed services.

- Section 5(a)(3) pertains to children whose attendance results directly from activities of the United States (e.g., sudden decrease in Federal contract activity).
- Section 8 pertains to additional payments for Section 5 programs.
- Section 9 pertains to enrollment increases of a temporary nature.
- Section 10 pertains to direct Federal construction on Federal property.
- Section 14(a) pertains to children on Indian lands.
- Section 14(b) pertains to areas where Indian lands are substantial.
- Section 14(c) pertains to areas where Federal land is substantial and where minimum facilities are needed.
- Section 16 pertains to disaster aid.

7. Program scope.

- New construction.[1]
- Equipment that is part of the new construction.

8. Year program was initiated and years when major changes were made.

- Program initiated in 1950.
- Major changes made in:
  - 1953. Law covered only those Federally-connected children who could be considered "unhoused" in the schools; changed the rate of payment for section 5(a)(2) children from 70 percent to 50 percent; broadened the definition of Federal property to include leased Federal property; and incorporated concept of minimum school facilities.
  - 1958. Section 5(a)(a) made permanent.
  - 1965. School Disaster Aid (Section 16) added.
  - 1966. Section 14 made permanent.
  - 1967. Section 14(a) and 14(b) made exclusive to Indians; pinpoint disaster aid added to Section 16.
  - 1970. Children living in Federally financed public housing covered for first time (added as parts of Section 5(a)(2) and 5(a)(3); Section 14(c) added.
  - 1974. Payment for children whose civilian parents worked on Federal land in another state eliminated.

9. Type of Federal grant or loan mechanism.

- Categorical - Project.

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[1] There is accompanying legislation (P.L. 81-874) which provides for operation (teacher salaries) and maintenance costs.

10. Type of recipient.

- Local educational school districts (agencies).

11. Eligibility and application requirements for state and/or locality to receive Federal funds.

- Project applications are submitted through the state educational agency to the Commissioner of Education. Increases in average daily membership, or the number of Federally connected children to total children, or the amount of Federal land in the school district to total land in the school district must be of certain magnitudes (depending on Section) before a school district can receive aid. See item 12 below.

12. Federal funds allotment procedures and matching requirements.

- Discretionary funding by Office of Education to individual projects.
- Maximum Federal payment under Section 5 is as follows: number of Section 5(a)(1) children times 95 percent of average per pupil cost of constructing minimum school facilities plus number of Section 5(a)(2) children times 50 percent of per pupil cost plus number of Section 5(a)(3) children times 45 percent of per pupil cost (maximum payment cannot exceed project cost).
- Maximum Federal payment under Section 9 can be in an amount equal to what is needed to construct minimum school facilities.
- Maximum payment under Sections 14(a) to 14(c) is that in excess of local, state and other Federal funds that is needed to provide minimum school facilities for the applicable number of Federally connected children.

13. Factors used in determining the Federal allotment:

- For Sections 5(a)(1) and 5(a)(2) school districts must absorb an increase of 6 percent or 1500 pupils (whichever is less) in average daily membership in the base year before a need is recognized; for Section 5(a)(3) it is the lesser of 6 percent or 2500 pupils; increase must be at least 20 pupils.
- Sections 5 and 9 applications cannot be made until the 3rd or 4th year of the increase period, i.e., a period of four consecutive years (after the base year) during which the increased membership occurs.
- For Sections 14(a) and 14(b), a four year increase period is also involved and Federally connected children must represent at least 33.3 percent and 10 percent for 14(a) and 14(b), respectively, of the total number of children educated by school district (at least 15 pupils must be involved); if Federal land (i.e., Indian land) in school district is substantial (same percentages as above), then a need is also recognized.

- For Section 14(c) one-third of Federally connected children must be inadequately housed (i.e., not in minimum school facilities) and one-third of land in district must be Federal land; also at least 20 children must be involved.
- In Section 14, the ability to finance minimum school facilities is considered, as well as local agency's effort to get tax receipts and other financial assistance.
- The Commissioner of Education has developed a priority index within Sections based on relative urgency of need to rank order projects for funding. Factors, as described above, are used with more weight going to applications having larger ratios of Federally connected children to total children and inadequately housed children to total children at the close of the 4 year increase period.
- Legislative amendments and appropriation language has also specified priorities across sections, e.g., current legislation states that eligible applications under Sections 9, 10, 14(a), 14(b) and 16 must be funded first when insufficient funds result; however, appropriation language since FY73 states that funds be expended on Sections 5, 14(a) and 14(b). Section 14(c) has not been funded to date, nor have projects relating to children living in Federally financed public housing.

14. Agency or Congressional rationale for using this procedure and variables.

- Intent of program was to compensate school districts for revenue lost due to non-taxable Federal property.

15. Degree to which states and localities influence project selection.

- Local education agencies have little influence on project selection. If they meet eligibility requirements, they are placed on priority list by Federal agency.
- State education agency must certify that project is not inconsistent with overall state plans for the construction of school facilities; they also provide data on per pupil cost of construction; thus, they do have some influence over project.
- The respondent to the 1975 Advisory Commission on Intergovernmental Relations' survey indicated that greater attention should be given to the locality's financial capacity by the Office of Education and the interrelationship between the locality and Office of Education could be modestly improved. All of the other questions answered pertaining to states' and localities' influence corroborated the statements made above. The Administrator judged that channeling the applications through the state, rather than directly to the Federal level, had not affected local participation.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- Documentation regarding appropriate eligibility requirements must be provided by applicant. This is stated in both laws and rules and regulations.

B. Is NA a precondition for grant, loan or direct Federal expenditure?

- Yes.

C. Does program provide additional grants-in-aid for conducting the NA?

- No.

D. Who conducts the NA?

- Local educational agency.

E. In what type of document is the NA contained?

- Project application.

F. How is need defined?

- A need results when Federal activities cause an increase in enrollment such that a school district's normal capacity of usable and available minimum school facilities is exceeded and children are without minimum school facilities. Moreover, the local educational agency must not have the tax base or other resources to finance needed construction.

G. What technique is to be used for conducting the NA, i.e. measuring the need?

- Standards for "minimum school facilities", "normal capacity".
- Parent-pupil surveys (for Section 5).

H. What are the key factors (variables) to be considered in doing the NA?

- Increased average daily membership over a 4 year period (Section 5).
- Percentage of Federally connected children to total children at the end of a 4 year period (Sections 14(a) and 14(b).

- Percentage of Federal land to total land in a school district (Section 14).
- Percentage of children inadequately housed to total children in district (Section 14(c)).
- School district's ability to finance needed school facilities (Section 14).
- School district's effort to obtain financing through taxes and/or other sources (Section 14).
- "Normal capacity" of school district's facilities.

I. With what frequency is the NA to be performed?

- Each time applicant requests Federal aid (e.g., parent-pupil surveys must be done in 3rd or 4th year of increase period).

17. Strengths and weaknesses.

- Congressmen from non-recipient areas and those who support general aid for education have tried to eliminate this program numerous times saying the program developed into a massive "pork barrel": many wealthy school districts receive aid, since eligibility requirements look at need but do not take sufficient account of capability or effort of school district to meet the need in whole or in part on their own. (Source: Congress and the Nation, various years).

18. Information on Federal funding for the PWI program.

- Authorizing legislation did not specify authorization amounts but rather set criteria (as described above) for determining how much money a local educational agency was entitled to, if any.
- Requested appropriations were based on amounts needed to provide funding to all eligible applicants under the law (requests were insufficient because it was thought that Sections 5(a)(2) and 5(a)(3) would terminate, which has not happened).
- Starting in FY67, appropriations provided have not been sufficient to provide funds to all eligible applicants.
- From 1950 through FY1977, $1.5 billion has been appropriated under P.L. 81-815.
- Backlog of potentially eligible unfunded applications under all sections of the act was estimated (in 1978) to exceed $500 million, according to the Office of Education.
- Presidents Eisenhower, Kennedy, Johnson, Nixon and Ford repeatedly tried to reduce the program, but with little success (Congress was reluctant to reduce program, particularly in election years).

19. Primary data sources for completing summary sheet.

- Congress and the Nation, Volumes I through IV.
- Office of Education, Administration of Public Laws 81-874 and 81-815, 27th Annual Report, 1978.
- 45 CFR 114, "Assistance for School Construction in Areas Affected by Federal Activities," April 8, 1975.
- Public Law 81-815, as amended through June 30, 1977.

Construction, Reconstruction and Renovation of Higher Education Academic Facilities/Office of Education, DHEW

1. PWI functional areas addressed in this study.

   - Higher Education Academic Facilities -- undergraduate academic facilities, graduate academic facilities, and public community colleges and technical schools.

2. Conceptual category of need satisfied by this PWI pgoram.

   - Equity considerations.
   - Improve quality of life.

3. Type of Federal program.

   - Federal grant-in-aid with matching by recipient.
   - Federal low interest direct loans, subsidized loans and guaranteed loans (to non-profit private institutions only) with matching by recipient.

4. Authorizing legislation.

   - P.L. 88-204 Higher Education Facilities Act of 1963.
   - P.L. 89-239 Higher Education Act of 1965, Title 7 (replaced 88-204).
   - P.L. 90-575 Higher Education Amendments of 1968.
   - P.L. 92-318 Education Amendments of 1972.
   - P.O. 94-482 Education Amendments of 1976, Title 1, Part G.

5. Implementing rules and regulations.

   - 45 CFR 170, "Financial Assistance for Construction of Higher Education Facilities".
   - Rules implementing P.L. 94-482 still pending.

6. Program objectives.

   - To carry out a program of grants and loans to institutions of higher education for the construction, reconstruction, and renovation of academic facilities.

7. Program scope.

   - New construction.
   - Reconstruction and renovation added in 1976.

8. Year program was initiated an years when major changes were made.

   - Program initiated in 1963. Basically grant and direct loan program for construction of classrooms and libraries.

- Major changes made in:
  - 1965. Removed restrictions that earmarked grant funds for libraries and classrooms where science, engineering, math, or language taught; reduced maximum interest rate to 3 percent from 3.875 percent.
  - 1968. Added a new program of subsidized interest on private loans.
  - 1972. Title 7 of P.L. 89-329 amended.
  - 1976. Reconstruction and renovation added to program scope; also programs designed to conserve energy or remove physical barriers added.

9. Type of Federal grant or loan mechanism.

   - Categorical-formula/project grants (for undergraduate facilities).
   - Categorical-project grants (for graduate facilities) and project loans.

10. Type of recipient.

    - Institutions of higher education. Public community colleges and technical schools, undergraduate academic facilities, graduate academic facilities.

11. Eligibility and application requirements for state and/or locality to receive Federal funds.

    - For formula/project grants, states must submit a plan and have it approved by the Office of Education; recipients file applications through the state, which must recommend approval to Federal agency; grants funds to each state based on a need formula.
    - For project grants and project loans, recipients file applications with the Office of Education.

12. Federal funds allotment procedures and matching requirements.

    - Combination of formula approach to states (who allocate funds via state plan to recipients) and discretionary funding by the Office of Education.
    - For grant programs, recipients initially had to supply at least 60 percent of funds (if 2 year college) and at least 66.7 percent of funds (if 4 year college). In 1968, match went to at least 50 percent for all recipients of grants (match varies by recipient, based on state criteria consistent with Federal criteria).
    - For direct loans, at least 20 percent of cost must be from non-Federal funds.
    - For subsidized loans, at least 10 percent of cost must be from non-Federal funds.
    - For guaranteed loans, at most 90 percent of loan will be guaranteed.

- For formula/project grants to undergraduate facilities at least 24 percent of funds had to go to community colleges and technical schools (in 1963 low percentage was 22; in 1965 low percentage requirement removed; the 1966 law said by FY69, 24 percent had to be met).

13. Factors used in determining the Federal allotment.

- For formula/project grant funds to community colleges and technical schools, factors include number of high school graduates in state and state allotment ratio (which is based on relative per capita income[1]) to determine state apportionment (each state gets at least $50,000). For formula/project grant funds to other undergraduate facilities, one-half of the funds apportioned based on number of students enrolled in institutions of higher education and one-half based on number of students enrolled in grades 9 through 12 (each state gets at least $50,000). Projects within states must be prioritized based upon: planned or expected increase in student enrollment; proposed increase in instructional and library facilities; favor those institutions using current facilities most effectively; favor those facilities committed to enrolling students from low income families and veterans returning to civilian life; and other criteria desired by each state.
- For project funds to graduate schools, the Office of Education is to prioritize projects based on factors including: projects resulting in wide distribution of graduate schools throughout the state; the establishment or continuation or improvement of an institution; increased capacity for the institution to supply highly qualified personnel critically needed in the community; adequacy of existing facilities to meet current and future demands; ability of institution to provide full financial support of the program; likelihood that assisted programs will draw highly qualified students and faculty; and increase in quantity and/or quality of graduate education in a relatively wide geographic area (no state can receive more than 12.5 percent of total funds).
- For subsidized loans, the Office of Education is to consider: 1) ability of applicant to secure funding under equally favorable conditions; 2) that the project will not be of elaborate or extravagent design or materials; and 3) actual needs.

[1]

$$\text{state apportionment} = \frac{\begin{pmatrix}\text{number of high}\\ \text{school graduates}\\ \text{in state}\end{pmatrix} \times \left(1 - (0.5)\ \frac{\text{state per capita income}}{\text{nation per capita income}}\right)}{\sum_{\text{state}} \left[\begin{pmatrix}\text{number of high}\\ \text{school graduates}\\ \text{in state}\end{pmatrix} \times \begin{pmatrix}\text{state allotment ratio}\\ \text{defined above}\end{pmatrix}\right]}$$

Priority to be given to community colleges, public technical institutes, developing institutions and institutions enrolling 20 percent or more students from low income families. After this, need is based on adequacy of facilities to meet demand or prevent decline in enrollment due to space and commitment to enroll veterans. (For subsidized loans, no state can receive more than 12.5 percent of total funds.)

- For direct loans, the Office of Education is to consider: 1) ability of applicant to secure funding under equally favorable conditions; 2) that the project will not be of elaborate or extravagant design or materials; and 3) actual needs.

14. Agency or Congressional rationale for using this procedure and variables.

- Formula approach for undergraduate facility grants assures that projects are consistent with state higher education plans.
- Discretionary funding for higher education facilities allows the Office of Education to approve projects so that the distribution of facilities across the states and country becomes more even and reflective of relative demands in different geographic areas.

15. Degree to which states and localities influence project selection.

- Recipients have little control since all funds, from their perspective, are competitive.
- States have power to grant funds to undergraduate facilities since they must approve or disapprove them prior to reveiw by the Office of Education.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- Needs assessment required for undergraduate facility grants.

B. Is NA a precondition for grant, loan or direct Federal expenditure?

- State Plan required for grants to undergraduate facilities only.
- Not required for grants to graduate facilities or for loans.

C. Does program provide <u>additional</u> grant-in-aid for conducting the NA?

- No, not in Title 7, as of 1972.
- Prior public laws appear to provide for planning grants to states.

D. Who conducts the NA?

- State Commission.

E. In what type of document is the NA contained?

- State Plan.

F. How is need defined?

- Need is not clearly defined in the public laws. Each state is to develop standards and methods consistent with Federal criteria specified in regulations.
- The rules and regulations for undergraduate facility grants say that the state commission will give consideration to:
  - planned enrollment growth (with 10 percent over 4 years a minimum).
  - capcity enrollment ratio.
  - serious deficiencies in quality of programs due to inadequate space.
  - age and condition of existing facilities which would be withdrawn from use.
  - other factors which would cause facilities to be functionally inadequate.
  - all projects must provide at least a 10 percent increase in current capacity or at least 10,000 square feet of instructional and library space.

G. What technique is to be used for conducting the NA, i.e., measuring the need?

- Not specified in public laws.
- Not clearly specified in rules and regulations.

H. What are the key factors (variables) to be considered in doing the NA?

- Not specified in public laws.
- See item (F) under this part; also part 13 pertaining to undergraduate facility grants.

I. With what frequency is the NA to be performed?

- State plan must be submitted annually.

17. Strengths and weaknesses.

- Few criticisms have been made regarding this responsibility of the Office of Education because the design and implementation of the program clearly reflect Congressional intent.

- Until recently, the Department of Education did not adequately monitor recipients; this, however, has been remedied. (Source: GAO 1976).

18. Information on Federal funding for the PWI program.

- Prior to 1963, proposals for aid to higher education were continually rebuffed; by 1965, extension of the program was widely supported.
- No funds have been appropriated since FY73 for higher education facility construction.

19. Primary data sources for completing summary sheet.

- Congress and the Nation, Volumes I through IV.
- House Committee on Education and Labor, and Senate Committee on Human Resources, A Compilation of Federal Education Laws As Amended Through June 30, 1977, June 30, 1977.
- Personal conversation with Richard Rowe, Acting Associate Deputy Commissioner, Higher and Continuing Education Bureau, Office of Education, DHEW, October, 1978.
- 45 CFR 170, "Financial Assistance for Construction of Higher Education Facilities", 1977.
- GAO, Survey of Assistance Provided to Institutions of Higher Education, letter dated December 1, 1976 to the Commissioner of Education.

Hill-Burton Program/Health Resources Administration, DHEW

1. PWI functional areas addressed in this study.

   - Hospitals and other health related facilities.

2. Conceptual category of need satisfied by this PWI program.

   - Protection of citizenry: public health (primary).
   - Improve quality of life.
   - Equity considerations.

3. Type of Federal program.

   - Federal grant-in-aid with state and local matching (1946).
   - Federal low interest loans (1970).
   - Federal loan guarantees with interest subsidies (1970).

4. Authorizing legislation.

   - P.L. 79-725 Hospital Survey and Construction Act of 1946.
   - P.L. 83-482 Medical Facilities Supply and Construction Act of 1954.
   - P.L. 88-443 Hospital and Medical Facilities Amendments of 1964.
   - P.L. 91-296 Medical Facilities Construction and Modernization Amendments of 1970.
   - P.L. 93-641 Health Planning and Resource Development Act of 1974 - Title 16.

5. Implementing rules and regulations.

   - 42 CFR 121, "National Guidelines for Health Planning".
   - 42 CFR 122, "Health Systems Agencies".
   - 42 CFR 124
   - Regulations to implement grant programs of P.L. 93-641 are still pending.

6. Program objectives.

   - To assist in a survey of state needs and to develop state plans for the construction of public and other voluntary nonprofit hospitals and other health facilities.
   - To assist in building such facilities.

7. Program scope.

   - New construction; modernization (renovation); equipment; land acquisition, if a public health center.

8. Year program was initiated and years when major changes were made.

- Initiated 1946-Basically hospital construction grants plus grants for survey of state hospital needs.
- Major changes in:
  - 1954. Program broadened to include nursing homes, diagnostic and treatment centers, rehabilitation facilities and chronic disease facilities; also survey of existing facilities.
  - 1964. Grants for hospital modernization added; also area-wide planning grants and long term care facility grants (previously chronically ill and nursing homes); minimum structural/design standards developed to assess physical condition of facilities.
  - 1970. Direct loans and loan guarantees authorized; grants/loans for public health centers, high blood pressure centers and other outpatient facilities (formerly diagnostic and treatment centers); construction and modernization project grants for emergency rooms; "equipment only" projects.
  - 1975. Hill-Burton replaced by Title 16 of Health Planning and Resources Development Act of 1974 (programs include: medical facility modernization; construction of new outpatient facilities; construction of new inpatient facilities in areas of recent rapid population growth, to be determined by DHEW; and conversion of existing medical facilities for providing new health services. Also state planning grants and grants to health systems agencies).

9. Type of Federal grant or loan mechanism.

- Categorical-formula/project.
- Categorical-discretionary (starting in 1970 and expanded in 1974).

10. Type of recipient.

- State and local agencies.
- Non-profit private organizations.

11. Eligibility and application requirements for state and/or locality to received Federal funds.

- States must submit a state plan (now called State Medical Facilities Plan) for approval by the Federal government. Project applications are submitted by localities to state and then to Federal agency for final approval. Since 1974, plan must prioritize individual projects for which funds will be sought.
- For discretionary funds applications sent directly to Federal agency.

12. Federal funds allotment procedures and matching requirements.

- Formula approach to states (with minimums for each type of facility) and via state plan to localities, i.e., individual projects. (Minimums per state increased over time in each category).
- Discretionary funding of individual projects.
- State/local matching requirements were first 2/3 (1946) then 1/3-2/3 depending on per capita income (1949), then 10 percent (1970) for facilities serving persons in poverty areas or for projects with a great potential for reducing costs, then zero percent (1974) if in rural or urban poverty areas.
- State/local matching requirements for loans or loan guarantees set at 10 percent of project cost (zero percent if in poverty areas--starting in 1974).
- State/local matching requirements for discretionary funds were 25 percent (and zero percent if in an urban or rural poverty area--starting in 1974).
- In 1970, law removed limitations on the amounts that could be transferred from one grant category to another so long as minimum for each category in each state was maintained.

13. Factors used in determining the Federal allotment.

- For formula grant monies, population and square of the state's allotment percentage (which was calculated on the basis of the state's relative per capita income)[1] -- in effect through 1974 for construction funds; for modernization funds starting in 1964, factors include population, per capita income, and relative need for modernization so that aid to hospitals in urban areas emphasized.
- For formula grant monies since 1974, factors include population, financial need (per capita income) and need for medical facilities (applies to construction and modernization grants).

[1]

$$\text{State allotment percentage of Federal funds} = \frac{\left(100 - \frac{\text{state index of per capita income with average state} = 100}{2}\right) \times (\text{state population})}{\sum_{\text{states}} \left[\left(100 - \frac{\text{state index...}}{2}\right) \times (\text{state population})\right]}$$

- For formula loan monies since 1970, factors include population, financial need (per capita income) and need for medical facility construction and modernization.
- For discretionary funds starting in 1974, to public institutions to eliminate or prevent safety hazards or avoid noncompliance with state licensure or accreditation standards.
- Initially in 1946, projects within states getting formula grant money for construction were to emphasize needs in rural areas and areas with low financial resources. This provision removed in 1970 to give priority to hospital construction funds to poorer areas and, at the option of the state, to rural areas; also, densely populated areas and poverty areas (as designated by DHEW) are to benefit first from funds for other kinds of construction or modernization. Starting in 1974, states had to use at least 25 percent of their formula monies for outpatient facilities in medically underserved areas and no more than 20 percent of their formula monies for construction of inpatient facilities (and only in areas of recent rapid population growth).

14. Agency or Congressional rationale for using this procedure and variables.

- Initial needs formula developed to pump money into areas (states) with low financial resources.
- As problems changed over time, Congress responded by changing emphasis and expanding scope of program. However, needs formula for grant monies did not change until 1974 and had become outdated before this--modernization program moderated this problem.

15. Degree to which states and localities influence project selection.

- States and localities have had increasingly greater influence particularly since mid to late 1960's on the selection of projects to receive Federal funding (or any funding for capital expenditures). States can overturn local decisions however, and the Federal government must still approve all projects. Nevertheless, states and localities are actively involved in the planning areas and do make decisions concerning which projects to approve and disapprove.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- Needs assessment is clearly defined and has received greater emphasis over the life of the program.

B. Is NA a precondition for grant, loan or direct Federal expenditure?

- Yes.

C. Does program provide additional grants-in-aid for conducting the NA?

- Yes. Grants were provided over the years for surveying state facilities and needs and for the operation of the state planning agencies and regional health planning agencies within states.

D. Who conducts the NA?

- State agency (with inputs from regional planning agencies since late 1960's).

E. In what type of document is the NA contained?

- State plan (now called State Medical Facilities Plan).

F. How is need defined?

- From 1946 to 1965, standards of adequacy had to be applied--basically they were ratios (by state) of general hospital beds to population for adequate hospital services (not to exceed 4.5 beds per 1000 population).
- Since 1965, three basic criteria used to determine bed need:
  - population (projected for five years).
  - current utilization rates (bed days per 1000 population).
  - occupancy rate.
  - also considered are existing beds and their condition (Hill-Burton has set structural standards relating to safety and fire hazards--since 1964).
- In March 1978, National Health Planning Guidelines established, providing occupancy and utilization criteria (also overall bed to population ratio for short stay hospital beds).
- Criteria for needs in other categories have historically not been as well defined.

G. What technique is to be used for conducting the NA, i.e., measuring the need?

- Planning standards.
- Survey of existing facilities and their condition.
- Regional plans (health system plans) now must be developed.

H. What are key factors (variables) to be considered in using NA?

- Population.
- Utilization.
- Occupancy.
- Current capital stock -- age, condition.

I. With what frequency is the NA to be performed?

- State medical facilities plan must be updated annually.

17. Strengths and weaknesses.

- Evolution of program from 1946 to 1973 found that Federal funds flowed in accordance with the intentions of the program and with the changes in emphasis over time (Source: Lave, Judith, et.al.).
- There were criticisms, starting in late 1960's, that the program was no longer needed due to an excess amount of beds - this criticism resulted in the phasing down of the Hill-Burton program by 1977 to far below its peak levels.

18. Information on Federal funding for the PWI program.

- "Need" for hospitals noted after WWII and Hill-Burton responded to this need.
- Shifting needs for medical facilities (by types and geographic areas) recognized in authorization legislation.
- Shifting emphasis to loans and loan guarantees.
- Shifting emphasis to need for modernization.
- Authorizations for construction-modernization started out at $75 million per year in FY1947, went to $150 million per year in 1949, went to $210 million per year in FY1954, went to $220 million per year in FY1961, went to $840 million for FY1965-1969, went to $295 million per year in FY 1970, went to $1.3 billion in grants and $1.5 billion in loans for FY 1971-1973, went to $390 million in grants in FY 1975-77, and "whatever is necessary" for loans in FY 1975-1977.
- Appropriations were usually for far less money than authorized in early years of program and in 1970s.
- Many felt towards early 1970s Hill-Burton no longer needed -- there was an excess of beds and no more construction needed (e.g., Nixon vetoed 1970 bill which was overridden by Congress).
- Through 6/30/71 Hill-Burton funds provided $3.7 billion in construction/modernization funds.

19. Primary data sources for completing summary sheet.

- Congress and the Nation, Volumes I through IV.
- DHEW, Health Planning and Resources Development Act of 1974.
- Lave, Judith, et al., The Hospital Construction Act: An Evaluation of the Hill-Burton Program, 1948-1973, American Enterprise Institute for Public Policy Research, Washington, D.C., May 1974.
- DHEW, Hill-Burton Program Report: July 1, 1947-June 30, 1971, 1973.

LAW ENFORCEMENT PROGRAMS

Federal Prison Construction/Bureau of Prisons, Department of Justice

1. PWI functional areas addressed in this study.

   - Federal prisons.

2. Conceptual category of need satisfied by this PWI program.

   - Protection of civil rights (primary).
   - Protection of citizenry: defense.
   - Improvement of quality of life.

3. Type of Federal program.

   - Direct Federal expenditures.

4. Authorizing legislation.

   - 18 U.S.C. 4042(2).

5. Implementing rules and regulations.

   - Internal documents and guidelines (e.g., Policy Statement on Determining Physical Capacities of Bureau Facilities, November 30, 1976).
   - There are no CFR citations.

6. Program objectives.

   - The Bureau of Prisons shall provide suitable quarters and provide for the safekeeping, care and subsistence of all persons charged with or convicted of offenses against the United States, or held as witness or otherwise.

7. Program scope.

   - New construction, renovation, replacement; acquisition and conversion of other government facilities (latter emphasis started in 1977-78 and will continue into early 1980's).

8. Year program was initiated and when major changes were made.

   - Bureau of Prison (BOP) created in 1930.
   - Basic legislation has not changed significantly over the last 20 years.

9. Type of Federal grant or loan mechanism.

   - Not applicable.

10. Type of recipient.

    - Federal agency.

11. Eligibility and application requirements for state and/or locality to receive Federal funds.

    - Not applicable.

12. Federal funds allotment procedure.

    - Discretionary funding by Congress for specific construction projects requested.

13. Factors used in determining the Federal allotment.

    - Existing prison population by region, security level, sex.
    - Estimated prison population by region, security level, sex.
    - Actual available bedspace by region, security level, sex.
    - Projects prioritized for new facilities based on where regional bedspace most deficient.
    - Also considered are:
      - Deficiencies within security levels.
      - The age and condition of capital stock (need to replace antiquated facilities that cannot meet standards even if renovated).
      - The ability to acquire existing surplus military or other government facilities in regions of greatest need.

14. Agency of Congressional rationale for using this procedure and variables.

    - Agency bases methodology on long experience and knowledge.
    - Agency responds to criticism (e.g., GAO inquiry).
    - Agency responds to Congressional appropriation levels (e.g., focus switched to acquiring surplus military facilities when funding levels were cut, since this approach could solve BOP's problems with minimal investment).

15. Degree to which states and localities influence project selection.

    - Projects selected by BOP go through state planning boards and clearinghouses. BOP must respond to their concerns; but otherwise, states have little influence on project selection.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- In response to a presidential directive, BOP in May 1970 outlined plans to "mold the Federal Prison System into a system of improved correctional programs that will serve as a model for the Nation". An important part was related to need for new correctional facilities to relieve overcrowding in existing prisons and to otherwise provide for better inmate treatment. (Needs assessments of this type were not done prior to 1970).

B. Is NA a precondition for grant, loan or direct Federal expenditure?

- Yes.

C. Does program provide additional grants-in-aid for conducting the NA?

- Yes. BOP operating budget provides for a planning staff.

D. Who conducts the NA?

- Federal Agency, The BOP.

E. In what type of document is the NA contained?

- Master plan (long range: initially 10 year period to 1980; revised to extend to 1985; currently these are 5 year plans).
- Initially, Master plan estimates included construction projects only (now plan includes acquisition of existing facilities for conversion as well).

F. How is need defined?

- Additional beds needed to:
  - Eliminate overcrowding and provide for anticipated increase in inmates (based on optimum capacity of institutions--new and old).
  - Eliminate antiquated facilities.
  - Develop new institutions to provide more humane and effective incarceration.

G. What technique is to be used for conducting the NA (i.e., measuring the need)?

- Planning standards; Survey of existing facilities by BOP personnel.
  - Federal government design standards for prisons (similar to American Correctional Assn. standards).

H. What are the key factors (variables) to be considered in doing the NA?

- Long-range forecast of inmate population by custody (security) level.
- Capacity of existing facilities to be retained.
- Optimum capacity of new facilities to be constructed.
- Number of Federal inmates that could be housed in non-Federal facilities.

I. With what frequency is the NA to be performed?

- Master plan updated twice a year in conjunction with the budget cycle.

17. Strengths and weaknesses.

- According to a 1976 GAO report:
  - Forecasting prison population by security level is deficient due to a lack of necessary data (e.g., custody level data on hand by BOP inconsistent with data on hand by each institution; and total prison population forecasts should include lower and upper bounds (at one time they did)).
  - Optimum prison sizes (by institution type, i.e., security level) not well documented.
  - Capacity of existing facilities is uncertain due to lack of specific written standards to determine capacity; hence, degree of overcrowding unknown.
  - Number of prisoners who could be housed in non-Federal facilities is uncertain.
  - Life-cycle costing not used in determining facility designs.

18. Information on Federal funding for the PWI program.

- Beginning in 1970, the problem of overcrowding was recognized; before that it was not a "hot" issue and little money was authorized for Federal prison construction; in FY80 and FY81 probably no money will be authorized.

- As of 6/30/75 construction cost of long range plan estimated at $460 million of which $111 million was appropriated; as of 9/30/78, $142 million appropriated.

19. Primary data sources for completing summary sheet.

- Personal correspondence with James Webster, Chief, Office of Facilities Development and Operations, Bureau of Prisons, October, December, 1978.
- GAO, Federal Prison Construction Plans Should be Better Developed and Supported, April 21, 1976 (GGD-76-10).

Law Enforcement Assistance to States and Localities/LEAA, Department of Justice

1. PWI functional areas addressed in this study.

   - State and local prisons; other law enforcement buildings and facilities (e.g., police stations, courthouses, etc.).

2. Conceptual category of need satisfied by this PWI program.

   - Protection of civil rights (primary).
   - Protection of citizenry: defense.
   - Improvement of quality of life.

3. Type of Federal program.

   - Federal grant-in-aid with state and local matching.

4. Authorizing legislation.

   - P.L. 90-351 Omnibus Crime Control and Safe Streets Act of 1968, Title 1, Part C.
   - P.L. 91-644 Omnibus Crime Control Act of 1970, Title 1, Sections 4 and 6.
   - P.L. 93-83 Crime Control Act of 1973, Title 1, Parts C and E.
   - P.L. 94-503 Crime Control Act of 1976, Title 1, Sections 109-112.

5. Implementing rules and regulations.

   - LEAA, Guideline Manual-Guide for Discretionary Grant Programs, updated yearly.
   - LEAA, Guideline Manual-Guide For Comprehensive State Law Enforcement Plans, updated yearly.

6. Program objectives.

   - Part C. To encourage states and localities to carry out programs and projects to improve and strengthen law enforcement and criminal justice.
   - Part E. To encourage states and localities to develop and implement programs and projects for the construction, acquisition and renovation of correctional institutions and facilities and for the improvement of correctional programs and facilities. (initiated in 1970).

7. Program scope.

   - New construction; purchase of facilities and equipment; renovation (land acquisition explicitly excluded). Currently, renovation is the only type of program for Part E funds.

8. Year program was initiated and years when major changes were made.

   - Program initiated 1968.
   - Major changes made in 1970, 1973, 1976:
     - 1970. Part E funds made available.
     - 1973. Improvement of criminal justice added to law enforcement as LEAA's mandate; also a plan for improvement of juvenile justice.
     - 1976. Annual court plans could be developed.

9. Type of Federal grant or loan mechanism.

   - Block-formula and discretionary.

10. Type of recipient.

    - States and localities.

11. Eligibility and application requirements for state and/or locality to receive Federal funds.

    - States must submit a comprehensive state plan and have it approved by LEAA to become eligible for Federal funds. Project applications (locality to state) must be submitted and approved by state planning agency. (If Part E funds are desired, application must be made in state plan.) Starting in 1973, localities with populations of 250,000 or more can submit a plan to the state (like the state submits to LEAA) to receive funding, eliminating the need for individual applications. If state fails to apply for grants, localities within state can apply directly to LEAA but must send copy of application to the Governor.

12. Federal funds allotment procedures and matching requirements.

    - Basically a combination of a formula approach to states (with specified pass through to localities)and discretionary project fundings to states and/or localities.
    - Part C funds:
      - 85% formula to state; 15% discretionary to state, localities or combination.
      - matching state/local requirements--for construction-50%; --for purchase-40% (1968) to 25%(1970) to 10% (1973).
      - effective 7/1/72 and 7/1/73, at least 40% and 100%, respectively, of the non-Federal matching funds must be included in appropriations specifically for this purpose from states or localities.
      - effective 7/1/72, states must provide 25% of non-Federal matching requirement.

- effective 7/1/73, states must provide 50% of non-Federal matching requirement.
- pass through from state to locality--at least 75% of Federal funds (1968); at least that part of Federal funds which corresponds to the part of the total statewide law enforcement expenditures for the preceeding year funded and spent by localities (effective 7/1/72); "an adequate share" of Federal funds to high crime areas (1970).

- Part E funds:
  - 50% formula to state; 50% discretionary to state, localities or combination.
  - matching requirements:
    - 25% (1970) to 10% (1973) for formula funds.
    - 50% for discretionary funds.
    - non-Federal matching funds must be included in appropriations specifically for this purpose from states or localities (1973).

13. Factors used in determining the Federal allotment.

- For formula money -- population in state relative to total population of states.
- For discretionary funds -- focus changes year to year to accomplish certain agency initiatives, but basic factors used for Part E funds include:
  - use of alternatives to incarceration.
  - physical condition of facility.
  - specification of need based on inmate population; cited deficiencies in jail inspection reports, court orders; use of advanced techniques or other nationally recognized design standards.
  - other administrative requirements.

14. Agency or Congressional rationale for using this procedure and variables.

- Crime is basically a local problem and must be dealt with by states and localities if it is to be controlled effectively; hence a block program with most funding giving states discretion vis-a-vis needs.

15. Degree to which states and localities influence project selection.

- State planning agencies have large discretion in selecting projects from the formula monies. Starting in 1973, localities of 250,000 or more people were given more discretion since they could submit a plan (rather than individual applications) and then locally decide where funds given to them could be spent. There is less state/local discretion for Part E funds (compared to Part C funds) since a greater percentage of Part E funds are subject to LEAA's discretion. All applications are subject to state and areawide clearinghouse review.

- The Administrator who completed the Advisory Commission on Intergovernmental Relations' 1975 questionnaire indicated that greater cooperation should be developed between the grant beneficiary and other agencies so that projects might be jointly funded. Through the survey, it became clear that the regional offices of the Law Enforcement Assistance Administration (while in existence; they were closed 9/39/77) had a great deal of authority delegated to them: these offices reviewed and approved grant applications, committed funds, and had a major responsibility for program review. The respondent concluded that channeling both grant applications and funds through the state rather than directly to the locality had little-to-no effect on local participation, presumably because the state's comprehensive plan must be approved before a locality's project will be funded.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- Comprehensive state plans must be submitted and approved by LEAA and must contain a "needs assessment" (stated in authorizing laws).

B. Is NA a precondition for grant, loan or direct Federal expenditure?

- Yes.

C. Does program provide additional grants-in-aid for conducting the NA?

- Yes. Planning grants ("Part B funds") go to state planning agencies ($100,000 minimum in 1968 raised to $200,000 minimum in 1973), based on population after minimums. (There are pass-through requirements to localities and matching requirements). In 1976 planning grants available to develop annual court plan for submission as part of the comprehensive state plan ($50,000 per state).

D. Who conducts the NA?

- State planning agency.

E. In what type of document is the NA contained?

- Comprehensive State Plan.

F. How is need defined?

- Law does not specify how each state must define need but criteria are contained in LEAA Guideline Manual.

G. What technique is to be used for conducting the NA, i.e., measuring the need?

- Basically a planning standards approach using approved recognized standards and/or court ordered standards. Also, inspection reports can document need. The state plan must contain a comprehensive outline of priorities for the improvement and coordination of all aspects of law enforcement and criminal justice including descriptions of: 1) general needs and problems; 2) existing systems; 3) available resources; 4) organizational/ administrative machinery for implementing plan; 5)direction and types of improvements to be made in the future; and 6) relationshp of plan to other state/local plans . Also, states must consult localities in development of the state plan.

H. What are the key factors (variables) to be considered in doing the NA?

- The law does not specify exactly what each state must look at other than (for Part E funds) saying advanced techniques in design/construction must be used. These are defined by the National Clearinghouse on Criminal Justice Planning and Architecture. There must also be an emphasis on development and operation of community-based correctional facilities (e.g., half-way houses, release programs, etc.).

I. With what frequency is the NA to be performed?

- State plan must be submitted annually.

17. Strengths and weaknesses.

- Law did not specify in enough detail how states should allocate funds to localities -- many high crime areas did not get "fair share"; the result was an amendment in the 1970 public law to correct this deficiency. (Source: Congress and the Nation).
- The state role has not been as potent as originally intended by Congress due to: requirements that state must submit annual plans to LEAA for approval; delays in guideline issuance by LEAA; a high rate of continuation funding; an emphasis on fund distribution; a lack of state authority to

plan for the state-local criminal justice system. (Source: ACIR)

- Many states, as a result, have developed project specific short term plans rather than long term balanced plans. (Source: ACIR).

18. Information on Federal funding level for PWI program.

- Authoriziations for LEAA (total) started at $100 million in FY69, peaked at $1750 million in FY73, and was $895 million in FY77 (Much criticism--for and against-- has occured concerning LEAA). Rising crime rates and assassinations in late 1960s prompted Federal government to take more active role in crime prevention.
- Criticism of LEAA prompted Congress to reduce authorizations in recent years.
- Part E appropriations started out at $47.5 million in FY71, peaked at $113 million in FY73, FY74, FY75, and was $73.7 million in FY77.
- Total appropriations were $69 million in FY69, peaked at $895 million in FY75 and were $753 million in FY77.
- Small percentages of Part C and Part E appropriations went to construction of facilties.

19. Primary data sources for completing summary sheet.

- Congress and the Nation, Volumes I through IV.
- Public Laws 90-351, 91-644, 93-83, 94-503.
- LEAA, Guideline Manual-Guide for Discretionary Grant Programs, 9/30/78.
- GAO, Overview of Activities Funded by the LEAA, 11/29/77 (GGD-78-21).
- ACIR, Safe Streets Reconsidered: The Block Grant Experience: 1968-1975, January, 1977.
- CBO, Federal Law Enforcement Assistance: Alternative Approaches, April 1978.

TRANSPORTATION PROGRAMS

Airport Development Aid Program/Office of Airports, FAA, DOT

1. PWI functional area addressed in this study.

   - Airports.

2. Conceptual category of need satisfied by this PWI program.

   - Promotion of commerce (primary).
   - Protection of citizenry: defense.

3. Type of Federal program.

   - Federal grant-in-aid with matching by recipient.

4. Authorizing legislation.

   - Since the original act in 1946, many laws were passed either extending the original act or making minor or major changes. The public laws below represent laws where major changes in the program were made.
     - P.L. 79-377 Federal Airport Act of 1946.
     - P.L. 84-211 Federal Airport Act Revision of 1955.
     - P.L. 87-255.
     - P.L. 91-258 Airport and Airway Development Act of 1970.
     - P.L. 94-353 Airport and Airway Development Act Amendments of 1976.

5. Implementing rules and regulations.

   - 14 CFR 152, "Airport Aid Program".

6. Program objectives.

   - To bring about, in conformity with the National Airport System Plan (NASP), the establishment of a nationwide system of public airports adequate to meet the present and future needs of Civil Aeronautics.

7. Program scope.

   - New construction.
   - Renovation.
   - Repairing.
   - Equipment.
   - Land Acquisition.

- More specifically, the current law provides for:
  - Land acquisition.
  - Site preparation.
  - Construction alteration and repair of runways, taxi-ramp, aprons and roads within airport.
  - Construction and installation of lighting utilities, navigational aids and certain offsite work.
  - Safety equipment.
  - Security equipment.
  - Snow removal equipment.
  - Noise suppressing equipment, construction of physical barriers and land acquisition for noise suppression terminal development.
  - Grants cannot be used for construction of hangars, parking areas or buildings unrelated to safety of persons at the airport.

8. Year program was initiated and years when major changes were made.

- Program initiated in 1946 - Authorized the Civil Aeronautics Administration (CAA) to prepare a national plan for the development of public airports and to provide grants for airport development (75 percent formula and 25 percent discretionary).
- Major changes made in:
  - 1955. Allowed contract authorizations (previously funds would only be obligated if actually appropriated); terminal facilities were not to be considered as ineligible for aid; restored the 75-25 percent split between formula and discretionary. In 1949 it was changed to 60-40 percent split (P.L. 81-382).
  - 1961. Contract authority was eliminated and appropriations once again were necessary before funds could be obligated; a special discretionary fund for the development of general aviation airports (those designed to provide alternate facilities for private pilots) set up for use by the FAA (in 1958 FAA was set up and it absorbed the CAA); prohibited use of funds for parking lots or terminals and other items not directly related to safety.
  - 1964. FAA wanted discretionary funds increased to 50 percent of basic funds but this was rejected by Congress (now 25 percent).
  - 1966. FAA transferred into newly created Department of Transportation; however, Secretary of DOT could not interfere with FAA's use of discretionary funds.
  - 1970. P.L. 79-377 repealed and replaced by P.L. 91-258. Required DOT to prepare a National Airport System Plan (NASP); provided for airport planning grants; provided for funds for general aviation airports (75 percent

formula and 25 percent discretionary); provided for funds for air carrier airports and other airports needed to relieve congestion (66.7 percent formula and 33.3 percent discretionary); required environmental assessment of proposed projects and also public hearings on proposed projects; required Federal certification of air carrier airports to ensure they met minimum safety standards; created an Airport Airway Trust Fund to collect taxes on users of the airport system which would then be used to finance a major part of the program.
1976. Authorized the Secretary of DOT to revise the NASP: divided airports into air carrier airports (including commuter airports) and general aviation airports (including reliever airports); expanded allowable costs to include items such as snow removal equipment, noise suppression barriers, and land adjacent to airports for noise abatement; air carrier airport funds to be 66.7 percent formula and 33.3 percent discretionary; general aviation airport funds to be 75 percent formula 24 percent discretionary and 1 percent to possessions and territories.

9. Type of Federal grant or loan mechanism.

   - Categorical-formula/project.
   - Categorical-project.

10. Type of recipient.

   - State, county, municipal or other public agency.

11. Eligibility and application requirements for state and/or locality to receive Federal funds.

   - Project applications must be submitted to the FAA and be approved by the FAA.
   - Project applications must represent airports listed in the National Airport System Plan.
   - No state plan is required.

12. Federal funds allotment procedures and matching requirements.

   - Formula approach to allot funds to states and then project applications (subject to FAA approval) to allot funds within states.
   - There are also discretionary funds.

- Under P.L. 79-377, Federal share could not exceed 50 percent (except for land acquisition where Federal share could not exceed 25 percent). In states with substantial areas of public lands, Federal share could be as high as 75 percent.
- In 1949, Federal share for installing high intensity runway lights increased to 75 percent (P.L. 81-277); Federal share for other aspects of runway lighting increased to 75 percent in 1961 (P.L. 87-255).
- In 1950, Federal share for land acquisition increased to 50 percent (P.L. 81-912).
- In 1970, general rule established that Federal share should not exceed 50 percent but provided for 82 percent if project related to navigation needs (e.g., land for approach lighting).
- In 1973, Federal share increased to 75 percent generally for airport construction, except at the largest airports (P.L. 93-44).
- In 1976, Federal share increased to 90 percent through FY 1978 and 80 percent for FY 1979 and FY 1980; at largest airports Federal share increased to 75 percent (Federal share for terminal development is 50 percent and no more than 60 percent of replacement funds for any FY can be used for such purposes).

13. Factors used in determining the Federal allotment.

- For formula monies -- allotment to states.
  - In 1946, half based on relative population and half based on relative land area.
  - In 1970, formula for general aviation airports same as before; for air carrier airports and reliever airports, one-fourth based on relative population, one-fourth based on relative land area and half based on relative number of passengers enplaned per year.
  - In 1976, allotments for air carrier airports (not including commuter) based on relative enplanements at each airport with aid being $6 per each of first 50,000 enplaned, $4 per each of next 50,000 enplaned, $2 per each of next 400,000 enplaned and $0.50 per each enplanement above 500,000; for general aviation airports (excluding reliever airports) formula was same as before.
  - Selection of projects within states based on safety, capacity and security factors as well as the national airport plan and timing of need (as of 1976 the formula that allots funds to air carrier airports did it explicitly to individual airports).

- For discretionary funds.
  - In 1946, funds obligated to carry out national airport plan to advance more funds to states in dire need of airports.
  - As of 1970, discretionary funds for air carriers, reliever and general aviation airports distributed at the discretion of the Secretary of DOT (and not FAA as under P.L. 79-377).
  - As of 1976, all commuter and reliever airport funds were distributed at the discretion of the Secretary of DOT.
  - Key factors always considered for prioritizing projects were safety, capacity, efficiency of operations, security, the National Airport System Plan and timing of need (essentiality).

14. Agency or Congressional rationale for using this procedure and variables.

- Discretionary funding for general aviation airports (starting in FY 1962) occurred so that FAA could give monies to those airports in most need (e.g., areas where congestion and safety at air carrier airports are most critical).
- Formula to apportion funds changed in FY 1976 for air carrier airports so that more funds would be channelled to small and medium air carrier airports.
- Discretionary funding to commuter and reliever airports starting in FY 1976 so that DOT could allot funds to areas in most need.

15. Degree to which states and localities influence project selection.

- FAA has final say on approval/disapproval; however, projects since 1970 subject to public hearings, areawide review and must be reasonably consistent with areawide airport system plans; thus states and localities can now voice their concerns.
- Also, since 1970, the results of planning grants to state or areawide planning agencies and localities are used as input to develop the NASP.
- The individual who completed the Advisory Commission on Intergovernmental Relations' 1975 survey suggested that clearer regulations, more technical assistance and increased coordination between the grant-aided activity and other state and local activities would moderately improve the program.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- Both the laws and rules and regulations show clear requirements for needs assessment.

B. Is NA a precondition for grant, loan or direct Federal expenditure?

- Yes. Prior to FY 1976, projects must have been in the then current national airport (system) plan developed by the CAA (or FAA); starting in FY 1976 projects must be for airports in the NASP.

C. Does program provide additional grants-in-aid for conducting the NA?

- As of 1970, planning grants are available to state or areawide planning agencies (for airport system plan) and to airports themselves (for airport master plans).
- All along, funds available to CAA (then FAA) to develop national airport plan (and then NASP).

D. Who conducts the NA?

- FAA develops the 10-year National Airport System Plan (NASP).
- State and areawide planning agencies and public agencies develop system plans and 20-year master plans, respectively, and these are used as input to the NASP.

E. In what type of document is the NA contained?

- FAA document. National Airport System Plan (prior to 1970, the National Airport Plan).
- Airports system plans from state/areawide planning agencies; airport master plans from local public agencies (e.g., airports).

F. How is need defined?

- Need is based on short, medium and long range demand estimates at individual airports and the ability of the current airport to handle demand and operate under FAA specified standards for airport operation and safety.

- Need is viewed as a function of:
  - Safety.
  - Security.
  - Capacity.
  - Efficiency of operation.

G. What technique is to be used for conducting the NA, i.e., measuring the need?

- Planning standards (with standards developed by the FAA) since 1970.
- Areawide or local surveys, studies, etc. to determine demand (short, medium and long range) for airports or airport systems.

H. What are the key factors (variables) to be considered in doing the NA?

- In developing the NASP, the Secretary considers:
  - Relationship of each airport to local transportation systems.
  - Forecasts in technological developments in aeronautics.
  - Forecasts in demand for air transportation (factors considered include GNP growth, fuel costs, air travel costs relative to automobile travel cost, employment rate, population, average aircraft seating).
  - Other modes of intercity transportation.
  - Factors affecting quality of national environment.
  - Airport system plans.
  - Airport master plans.
  - Current airport facilities and relationship to FAA's standards for airports in areas of safety, security, capacity.
- In developing system plans and master plans, some kinds of items considered by planning agencies and airport owners are:
  - Emphasis on maintaining viability of airports to accommodate projected demands.
  - Special emphasis on noise suppression.

I. With what frequency is the NA to be performed?

- Plans are revised as necessary.
- First NASP required by 1/1/73; revised NASP required by 1/1/78[1]; between major editions, NASP kept current by revisions made in the computer stored data bank.

[1]NASP plan of 1/1/78 (the 1978-1987 plan) recommends more than $10.6 billion in eligible development.

17. Strengths and weaknesses.

- Formula approach (since 1970) for air carriers does consider need explicitly (i.e., enplanements rather than population); however, capability and effort are not explicitly considered.
- In developing the NASP, alternate modes of transportation are considered.
- However, there has been some criticism that the local planning process is deficient; there is no local input into the NASP for many airports. (Source: GAO).

18. Information on Federal funding for the PWI program.

- 1946 law authorized because President Roosevelt wanted a nationwide postwar development of airports to stimulate domestic aviation and to cushion the shock of converting from the war effort.
- Initially $20 million was authorized for FY 1947-FY 1953.
- In 1950, Congressional Committee noted Congress only appropriated small amounts of authorizations and that program objectives could not be met unless law extended; as of 1954 only half of authorized amount was appropriated.
- In Eisenhower's 1959 budget message, he said airports should pay for development costs and that programs should be phased out by 1964; Democrats disagreed and continued programs at same level and no presidential veto occurred.
- When Kennedy took office, and through the Johnson years, authorizations were raised slightly; Johnson tried to supplant grant program with a one billion dollar loan program but Congress did not act on this.
- A 1968 Aviation Subcommittee report said that by 1975 $6 billion would be needed in the National Airport System.
- The FAA, in a 1969 summary of long range planning assumptions, said that if age and the state of technology were used as criteria for obsolescence, then most equipment in commissioned facilities were obsolete but not unsafe.
- In 1969, Nixon said, "years of neglect have permitted problems of air transportation of stack up like aircraft circling a congested airport"; result was a massive new program starting in FY 1971 which has continued to grow extensively.
- 1970 law was authorized because Congress recognized that the nation's airports and airway system were inadequate to meet current and projected growth in aviation; Congress also stated substantial expansion and improvement of the system was required to meet demands of interstate commerce, the postal service and national defense.
- Starting in 1955, appropriations were set at authorization levels; this occurred through FY 1966; from FY 1967 to FY 1970 appropriations were cut by more than half and were less than half of authorized amount; starting again in FY 1971, appropriations kept pace with authorizations (see Exhibit A.2, attached).

19. Primary data sources for completing summary sheet.

- Congress and the Nation: 1945-1964, 1965-1968, 1969-1973, 1973-1976.
- FAA, Eighth Annual Report of Operations Under the Airport and Airway Development Act (for FY ended 9/30/77), 1978.
- 14 CFR 152, "Airport Aid Program".
- P.L. 91-258, as amended by P.L. 92-174, P.L. 93-44, and P.L. 94-353.
- DOT, FAA, National Airport System Plan: 1978-1987, 1977.

Exhibit A.2: Airport Development Aid Program (ADAP)
Authorizations and Appropriations

	Authorizations					
Fiscal Year	Air Carrier	Commuter	General Aviation	Reliever	Total	Appropriations
1947	520				520	42.75
1948	*				*	30.6
1949	*				*	37
1950	*				*	36.5
1951	*				*	21.2
1952	*				*	15.85
1953	*				*	10.28
1954	0				0	0
1955	0				0	20.75
1956	42.5				42.5	62.5
1957	63				63	63
1958	63				63	63
1959	63				63	63
1960	63				63	63
1961	63				63	63
1962	68		7		75	75
1963	68		7		75	75
1964	68		7		65	65
1965	68		7		75	75
1966	68		7		65	65
1967	68		7		75	71
1968	68		7		75	66
1969	68		7		75	70
1970	68		7		75	30
1971	250		30	**	280	170
1972	250		30	**	280	280
1973	250		30	**	280	280
1974	275		35	**	310	300
1975				**	335	340
1976 +TQ	416.25	18.75	46.25	18.75	500	438
1977	425	15	55	15	510	545
1978	450	15	60	15	540	
1979	480	15	65	15	575	
1980	510	15	70	15	610	

--Program not yet started

* Authorization shown in FY47 was for FY47-FY53

** Reliever airports authorization included in air carrier authorization

Federal Aid Highway Program/Federal Highway Administration, Department of Transportation

1. PWI functional area addressed in this study.

   - Highways, bridges, and streets.

2. Conceptual category of need satisfied by this PWI program.

   - Promotion of commerce (primary).
   - Protection of citizenry: defense.

3. Type of Federal program.

   - Formula and project grants.

4. Authorizing legislation.

   - Federal-Aid Road Act of 1916 (39 Stat. 355).
   - Revenue Act of 1932 (47 Stat. 169).
   - Federal-Aid Highway Act of 1944 (58 Stat. 838).
   - Federal-Aid Highway Act of 1956 (70 Stat. 374).
   - Department of Transportation Act of 1966 (80 Stat. 931).
   - Federal-Aid Highway Act of 1970 (84 Stat. 1713).
   - Federal-Aid Highway Act of 1974 (88 Stat. 2281).
   - Federal-Aid Highway Act of 1976 (90 Stat. 425).

5. Implementing rules and regulations.

   - 23 CFR Highways.

6. Program objectives.

   - To assist state highway agencies in constructing and rehabilitating the Interstate Highway System and for building or improving primary, secondary, and urban system roads and streets, and to provide aid for their repair following disasters, to foster safe highway design, and replace unsafe bridges.

7. Program scope.

   - New construction, reconstruction and repair improvement.

8. Year program was initiated and years when major changes were made.

- In theory, the Federal interest in transportation stems from the constitutional directive that the Federal Government regulate interstate commerce, establish postal routes, provide for the national defense, and promote the general welfare. In practice, the interest took shape in two types of Federal activities: (1) promotional activities, such as grants-in-aid for facilities construction and subsidies; and (2) regulatory activity, such as safety and economic regulation to insure efficient and fair competition, as well as to protect intermodal competition and prevent discrimination. Federal promotional interest in transportation was expressed early in the 19th century, when Congress first granted funds for building highways leading westward (1806); improvements of rivers and harbors (1824); and land grants and monetary loans to encourage railroad building (1840). Federal regulatory interest was also expressed in the 19th century with the creation of the Interstate Commerce Commission in 1887.
- Before 1916, there were few Federal programs for highways. In 1916, with the enactment of the Federal-Aid Road Act (P.L. 39-355), the basic building blocks for Federal assistance in highway construction were established. Several elements of Federal policy that were established at that time continue to be embodied in present day programs, especially:
  (1) The Federal-state relationship, whereby Federal assistance is channelled through state highway departments that take direct responsibility for implementation.
  (2) A Federal-state matching ratio, whereby the state must participate directly in program funding.
  (3) Distribution of funds among the states by an apportionment formula, originally based on area, population, and road mileage.
  (4) The Federal-state relationship, whereby the construction, ownership, and maintenance of highways were the responsibility of the state.
- The Federal Highway Act of 1921 included an important provision not found in the 1916 Act. The 1916 Act had failed to require that Federal-aid funds be spent on a designated system of interconnected roads. The 1921 Act required the state to designate a system and give preference to those projects among the candidates for Federal aid that would complete a system of interstate roads. The routes so designated became the basis for what is known as the Federal-aid primary system.
- The Revenue Act of 1932 established an excise tax of one cent a gallon on motor fuels. The tax was to go into a general fund. Motor fuel tax receipts were not formally dedicated to highway programs until the Highway Trust Fund was established in 1956.

- The 1938 Federal-Aid Highway Act required that the Commerce Department's Bureau of Public Roads submit reports to the Congress. The report that resulted from this requirement advocated the construction of a comprehensive system of free highways. The 26,700-mile system recommended in this report provided the original concept behind today's Interstate System. A later report, entitled Interregional Highways, proposed a controlled-access network of about 39,000 miles.
- The Federal-Aid Highway Act of 1944 provided greatly expanded funding and established separate, proportional authorizations for three categories of highways -- the primary system, the secondary system, and the urban extensions of the primary system -- which became known as the ABC programs. The proportions authorized for each system -- 45 percent for the primary system, 30 percent for the secondary system, and 25 percent for the urban extensions -- remained constant until 1974, when somewhat different apportionments were established. Until 1974, primary highway funds were apportioned among the states, one-third in the ratio which the area of each state bore to the total area of all states, one-third in the ratio which the population of each state bore to the population of all states, and one-third in the ratio which the rural delivery and star route (mail route) mileage bore to such total mileage of all states. Secondary funds were apportioned in a similar manner, but with one-third based upon a rural population ratio instead of a total population ratio as for primary funds. Urban funds were apportioned entirely in the ratio which each state's municipality and other urban area (over 5,000) population bore to the same population of all states. The Interstate System was authorized by the 1944 Act, though no specific apportionment of funds was made to the Interstate System because it was incorporated in the primary road network and its urban extensions. Further, because the matching ratio remained 50:50, there was no financial incentive for the states to give priority to construction of the Interstate System.
- With the Federal government paying for 50 percent of the ABC program and 50, 60, then 90 percent of the Interstate program, a major problem besetting Federal participation in highway construction involved financing. Originally, all Federal-aid highway program authorizations were made from general revenues of the Treasury. Though there was no specific Congressional interest, authorizations usually were made in amounts equal to the revenues collected by the Treasury from such highway-user taxes as those on motor fuels, tires, and truck weights. When Congress in 1956 fully authorized the Interstate program and expanded the ABC program, a new financing method was established -- the Highway Trust Fund.

Title I of the 1956 Highway Act (P.L. 84-627) changed the matching formula for determining the Federal share of construction costs on the Interstate system to 90 percent (Federal)- 10 percent (state); changed the method of apportioning Interstate funds to the states during the 1960-69 period to the ratio by which cost estimates for completing the system in each state bears to the cost estimates for completing the system in all states; and increased the total mileage of the Interstate system from 40,000 to 41,000 miles. Title II of the 1956 Act, termed the Highway Revenue Act of 1956, increased some excise taxes and created new taxes. Only taxes on rubber retreads and on heavy-vehicle use had not been imposed. Motor fuel taxes were increased to three cents a gallon, the most significant change in tax rates of the 1956 Act. The new tax on heavy vehicle use was established to create a more equitable relation between the user charge paid and the costs incurred for construction to accommodate heavy vehicles; this user tax reflects Congressional concern over the equity of highway financing across different types of users.

The 1956 Act included the Byrd amendment which required that the Highway Trust Fund not operate at a deficit at any time. The law gave ABC highways first call on money in the Fund; cuts to avoid deficits were to be made entirely from Interstate system apportionments.

- The Federal-Aid Highway Act of 1959 was passed to meet President Eisenhower's request for an increase in the Federal gasoline tax and to keep work on the Interstate system from falling behind schedule. Title II of the Act (P.L. 86-342) raised for two years the Federal tax on gasoline, diesel, and special motor fuels by a penny a gallon to four cents.
- The Federal-Aid Highway Act of 1961 (P.L. 87-61) recognized that the cost of completing the Interstate System was substantially above the $25 billion originally anticipated for the 13-year program -- $41 billion was accepted as a more realistic estimate. The new estimate was approved as the basis for making apportionments. Title II of the Act continued the (temporary) tax on motor fuels at four cents and increased the taxes on tires, buses, and trucks.
- The 1965 amendments to the Federal-Aid Highway Act authorized the Secretary of Commerce to apportion Interstate funds on the basis of the 1965 cost estimate for completing the system. The new estimate was $46.8 billion, an increase of $5.8 billion over the 1961 estimate, attributed to improved design standards and higher costs of land acquisition, as well as road construction.

- With the Federal-Aid Highway Act of 1966, all the revenues from highway-related Federal taxes on motor fuels, new trucks, truck parts, lubricating oils, and heavy-vehicle use were transferred to the Trust Fund and used only for Federal highway programs. The excise tax on new automobiles became the only highway-related excise tax not dedicated to the Trust Fund. The rate of the auto excise tax was raised to 7 percent in a 1966 revenue measure, and the tax continued to be considered a general revenue.
- In 1966, Congress enacted legislation requested by President Johnson creating a Department of Transportation. When established in 1967, the new department became the 12th Cabinet-level department. The administration of most highway programs -- including the Bureaus of Public Roads, Motor Carrier Safety, and National Highway Safety -- was consolidated under the Federal Highway Administration. The autonomy of the Bureau of Public Roads was reduced by being made a part of a broader-based transportation agency.
- The Federal-Aid Highway Act of 1968 accepted the 1968 cost estimate for the Interstate System of $56.5 billion as the basis for apportioning interstate funds, increased interstate mileage from 41,000 to 42,500 miles, and extended the completion date to 1974.
- The Federal-Aid Highway Act of 1970 reaffirmed the decision to press ahead with completion of the Interstate System, despite the $13 billion cost increase since the 1968 estimate; the increase was attributed to the mileage added by the 1968 Act (1,500 miles). The completion date was extended to 1976. Public Law 91-605 prohibited the impounding of appropriated highway funds by the executive branch and prohibited the use of trust funds by any Federal agency except the Federal Highway Administration. The Act also increased the share of Federal funding to 70 from 50 percent for FY 1974 and all subsequent years.
- The 1970 Act permitted a number of new uses for the Trust Fund, like the construction of public transportation facilities (exclusive bus lanes). Urban system, which became known as the "D" system, was added as a new Federal-aid highway system. The new system was to serve major centers of urban activity and to connect with, but not overlap, the urban extensions of other Federal-aid systems. The Special Bridge Replacement Program was established to replace important, unsafe bridges, with funding from the Trust Fund.
- The Federal-Aid Highway Act of 1973 (87 Stat. 250) contained a number of new features providing Federal assistance for mass transit. Urban system funds ("D") were increased and could be used for a transit project in lieu of a highway project. Further, mass transit projects could be substituted for unwanted segments of the Interstate System.

Although the provisions regarding highway assistance in urban areas and potential substitutions of mass transit were probably the most significant features of the 1973 Act, a number of other important changes were implemented. For the first time, interstate system funding levels were reduced in favor of more funds for ABC and other programs. The completion date of the interstate system was extended to 1979 to compensate for the reduced funding. The proportions to the ABC systems were officially changed for the first time since 1944; rural primary roads received somewhat larger proportions and urban extensions somewhat lower ones. The 1973 law allowed transfers between programs up to 40 percent of ACBD funds.

- The Federal-Aid Highways Amendments of 1974 not only provided small increases in authorizations for rural roads and established new categorical programs, but also amended the size and weight provisions for trucks (first time since 1956). The amendments broadly interpreted Federal Highway Administration guidelines to allow Federal highway aid to be used for resurfacing and reconstruction of pavement surfaces.
- The Federal-Aid Act of 1976 authorized construction on the interstate system an additional 11 years, to 1990. A decision on the long-term future of the Highway Trust Fund was deferred until the next Congress. Three of the existing categories -- the rural primary, the urban extensions, and the priority primary routes -- were combined under a new primary system. Though the 1974 amendments had allowed trust funds to be used for resurfacing, restoration, and rehabilitation (RRR) in principle, the 1976 amendments granted assistance for the first time, representing a major new use for the Trust Fund. For non-interstate construction projects, redefinition of the term "construction" permitted allowed funds to be used for RRR.

9. Type of Federal grant or loan mechanism.

   - Categorical-formula.

10. Type of recipient.

    - State highway agencies.

11. Eligibility and application requirements for state and/or locality to receive Federal funds.

    - A highway project is generally not eligible for Federal-aid highway funds unless it is on one of the Federal-aid highway systems. States and local units of government have the responsibility for selecting the routes to be included in the systems, subject to approval by the Federal Government.

12. Federal funds allotment procedures and matching requirements.

- The Federal funding of highway projects on routes on the Federal-aid systems is governed by provisions of Title 23 of the U.S. Code and is administered through state highway agencies. Federal assistance for highways is reflected in the several programs which, when combined, make up the Federal-aid highway program. The programs, each of which is separately funded by Congress, can be organized into three groups -- system-related programs, nationally-oriented programs, and special programs.
  - System-Related Programs. The largest portion of Federal assistance for highways -- more than 80 percent of total Federal funds authorized -- is earmarked for improving the Federal-aid system. These programs have as their goals the construction, reconstruction, and improvement of roads on the Federal-aid system. They include the Interstate, Primary, Secondary, and Urban programs.
  - The Interstate program is the largest funded Federal-aid highway program and receives nearly one-half of the Federal-aid highway funds. Most of these funds are used for the construction of the 42,500-mile national system of interstate and defense highways. Interstate funds are apportioned among states in the ratio of the estimated cost of completing the system in each state to the estimated cost of completing the Interstate system in all states. The overall estimate of cost to complete must be submitted by the Transportation Secretary to the Congress for approval. Because the interstate system is regarded of paramount importance to the nation and is to be completed at the earliest possible date, the normal Federal share is 90 percent; certain interstate routes may, under certain conditions, be withdrawn from the system and be replaced by either another type of Federal-aid highway or a mass transit project, though the Federal share of substituted projects is the same as for other projects on the Federal-aid system, normally 75 percent (raised from 70 percent by the 95th Congress, 2nd Session).
  - Primary Program roads are regarded as those which are the most important to interstate, regional, and statewide travel. The routes, which are rural arterials and their extensions through urban areas, are chosen by the states with the approval of the Secretary of Transportation. Most of the routes are state-owned and maintained systems. The Federal-state matching ratio is 75-25.

- Secondary Program roads are comprised of important intercounty roads. The system consists of many locally owned and maintained routes, as well as less important state routes.
- Urban Program was established in 1970 as a system of supplementary roads to serve local urban transportation needs. Selection of the system locations in each urban area is made by local officials with the concurrence of the state highway agency. Urban system funds, in addition to having the normal uses of all Federal-aid highway funds, may be used for the purchase of transit buses, rapid rail cars and for the construction, reconstruction, and improvement of fixed rail facilities. Unlike most other projects which are initiated by state highway departments, urban system programs are selected by local officials and approved by state officials.
- The Federal-aid urban system apportionment formula is much simpler than formulas for the primary and secondary systems in that it is the ratio of the urban population in each state to the total population of all urban areas in all states.
- By contrast, the Federal-aid primary system weights one-third of the ratio of urban population in each state to the urban population of all states and weights equally at two-ninths the ratios of area of each state, rural population of each state and mileage of rural delivery and intercity mail routes to all states. The Federal-aid secondary apportionment formula gives the same weight, one-third, to area of each state rural population of each state, and mileage of rural delivery and intercity mail routes in each state to all states.
- Nationally Oriented Programs transcend system boundaries, focusing on problems common to all systems. They include efforts to make the driver, vehicle, and roadway safer. For example, funds are used to reconstruct and replace unsafe bridges, demonstrate the value of pavement markings, and eliminate hazards at railroad-highway crossings.
- Special Program funds are applied both domestically and internationally to projects that the states or foreign nations cannot pay for alone.

13. Factors used in determining the Federal allotment.

- Population.
- Area.
- Road mileage.

14. Agency or Congressional rationale for using this procedure and variables.

- The 1916 Federal-Aid Road Act established the present Federal-state relationship, whereby Federal assistance is channelled through state highway departments that take direct responsibility for implementation, which includes construction, ownership, and maintenance of the highways. Consequently, the state highway agency is solely responsible for reviewing, as well as approving or rejecting, specific state projects.

15. Degree to which states and localities influence project selection.

- States and local units of government have the responsibility for selecting the routes to be included in the Federal-aid highway systems subject to approval by the Federal government. The designation of a route as a part of a Federal-aid system does not imply that Federal funds have been or will be spent on portions of that route -- it means that the local road is eligible for Federal assistance.
- The Federal Highway Administrator who completed the Advisory Commission on Intergovernmental Relations' 1975 questionnaire generally accorded the program favorable review. He was mildly critical of the Agency's interaction with local governments vis-a-vis the formulation and modification of regulations and guidelines. He indicated no specific difficulty with the delegation of authority to the regional offices of the Highway Administration, which approve and disapprove state highway plans.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- Both the law, as amended, and Title 23 of the U.S. Code outline what factors should be considered by the state when submitting not only its documentation for routes to be included in the Federal-aid system, but also biennial highway programs.

B. Is NA a precondition for grant, loan or direct Federal expenditures?

- Yes.

C. Does the program provide additional grants-in-aid for conducting the NA?

- No.

D. Who conducts the NA?

- State agency with assistance from locality.

E. In what type of document is the NA contained?

- After a state's program has been approved by the Secretary, the state highway department shall submit such surveys, plans, and estimates for each proposed project of the approved program. If these project plans are approved by the Secretary, then the Federal Government may proceed to contractual obligations.

F. How is need defined?

- Expedite completion of interstate highways.
- Expedite the construction of projects deemed important to the national defense by the Defense Secretary.
- Incorporate standards and features with safety benefits.
- Provide direct convenient access to public airports and ports for water transportation.
- Save travel time and energy consumption.
- Reduce traffic accidents and congestion.

G. What technique is to be used for conducting the NA, i.e., measuring the need?

- Expert opinion andjudgment are used (for everything but the design criteria) because needs to be met are projected some 20-years in the future.

H. What are the key factors (variables) to be considered in doing the NA?

- The state highway departments submit to the Secretary a program of proposed projects for utilization of the apportioned funds. In approving plans for projects on the Federal-aid systems, the Federal Highway Administration is charged with providing leadership and

programs that are balanced with other modes constituting the national transportation capability, that effectively satisfy national, regional, and local requirements for the movement of people and goods. The optimum to be achieved by these programs is: (1) to assure convenient movement of passengers and property by the most efficient means consistent with public safety; (2) to provide economical movement on nation's highways; (3) to provide highway access to and within Federal lands; (4) to promote economic growth development; (5) to contribute to the highway transportation requirement of national defense; and (6) to enhance environmental values along the nation's highways (junkyard and billboard control, etc.).

- The state project "needs" proposal should detail: (1) traffic forecast, not only of volume, but also by vehicle classification; (2) highway system classification (primary, secondary, urban) which relates to sharing road user tax incomes; (3) design standards which relate level of service (speed and comfort) composition of the traffic, and the character of the local land and terrain affecting construction costs; and (4) service levels and adequacy as determined by surface type, surface width, and past and future level of maintenance.

I. With what frequency is the NA to be performed?

- Biennially, if the state highway agency has eligible Federal-aid projects needing approval and subsequent funding.

17. Strengths and weaknesses.

- Although spending for highways by all levels of government has grown substantially since 1956, when the Federal Highway Trust Fund was established, and increased from $8.3 billion in 1956 to an estimated $30 billion in 1977, the physical condition of our highways deteriorated somewhat during the 1970's. This is because of declining capital improvement spending (in constant dollars), and increased vehicle usage. The Federal Highway Administration reported that the overall condition changed from good to fair between 1970 and 1975. The 1976 Federal-Aid Highway Act allows states to use Federal funds for resurfacing, restoration, and rehabilitation, although not for maintenance.

18. Information on Federal funding for the PWI program.

- After Congressional authorization of funds for the several Federal-aid programs, the maximum amounts of funds are apportioned to the states for their various highway programs. Once apportioned, the funds are available for use or obligation by the states, i.e., the states have the authority to incur spending obligations with commitments from the Federal Government to be reimbursed by the government for the Federal share of the project's cost. Finally, an annual appropriations act is passed which provides the cash to liquidate obligations incurred by the states. The Highway Trust Fund provides the cash to reimburse the states for expenditures on Federal-aid highways.
- As can be seen from Exhibit A.3, attached, authorizations for non-interstate programs have steadily increased over time. This statement conceals the probable fact that non-interstate expenditures have gone to law enforcement, safety, interest payments, maintenance and administration; after adjustments for these non-capital items and inflation, capital spent for highways has probably actually decreased.
- The 1974 Congressional Budget and Impoundment Control Act essentially tied the use of contract authority to the revenues available in the Trust Fund. The existence of the Trust Fund does not require that Federal highway authorizations keep pace with its revenues. It merely sets an upper limit which Congress must consider when authorizing funds for highway programs. Authorizations are set so that obligations will not exceed amounts available in the Trust Fund at a future date; thus, the Trust Fund puts the highway program on a pay-as-you-go basis. In recent years, the appropriations have been in balance with Trust Fund receipts.

19. Primary data sources for completing summary sheet.

- Federal Highway Administration Publications.
  - 23 CFR Highways.
  - "America on the Move," 1977 edition.
  - Your Guide to Programs of the Federal Highway Administration.
  - Economic Considerations in Nationwide Highway Needs and Benefit Estimating Study, October 4, 1968.
- Congress and the Nation, Volumes I through IV.
- GAO Publications.
  - Transportation Issues, October 10, 1978.
  - U.S. Transportation System -- Federal Government Role and Current Policy Issues, October 22, 1975.
  - Improving and Maintaining Federal-Aid Roads, February 2, 1977.
- Congressional Budget Office, Highway Assistance Program: A Historical Perspective, February 1978.

Exhibit A.3: Highway Program Levels for Trust Fund, General Fund, and All Programs, Measured by Authorizations, Obligations, and Outlays: Fiscal Years 1957-1977, In Millions of Dollars[1]

	1957	1958	1959	1960	1961	1962	1963	1964	1965
AUTHORIZATIONS									
Trust Fund Programs									
Interstate	1,000	1,700	2,200	2,500	1,800	2,200	2,400	2,600	2,700
Non-Interstate	155	880	1,305	933	955	958	955	980	1,005
Total Trust Fund	1,155	2,580	3,505	3,433	2,755	3,158	3,355	3,580	3,705
General Fund Programs	977	122	131	124	128	128	183	181	1,043
Total—All Programs	2,132	2,702	3,636	3,557	2,883	3,285	3,538	3,761	4,748
OBLIGATIONS									
Trust Fund Programs									
Interstate	1,386	1,861	2,283	1,717	2,228	2,121	2,910	3,141	2,979
Non-Interstate	839	1,087	1,226	895	948	905	1,017	1,023	1,038
Total Trust Fund	2,225	2,948	3,509	2,612	3,176	3,026	3,927	4,164	4,017
General Fund Programs	133	145	123	128	134	143	146	169	224
Total—All Programs	2,358	3,093	3,632	2,740	3,310	3,169	4,072	4,332	4,241
OUTLAYS									
Trust Fund Programs									
Interstate	211	673	1,501	1,861	1,719	1,914	2,109	2,635	3,016
Non-Interstate	755	839	1,112	1,079	900	870	908	1,010	1,010
Total Trust Fund	966	1,512	2,613	2,940	2,619	2,784	3,017	3,645	4,026
General Fund Programs	126	125	145	127	137	136	146	162	191
Total—All Programs	1,092	1,637	2,757	3,067	2,756	2,920	3,163	3,807	4,217
HIGHWAY TRUST FUND STATUS									
Receipts	1,482	2,044	2,088	2,536	2,799	2,955	3,293	3,540	3,670
Outlays	966	1,512	2,613	2,940	2,619	2,784	3,017	3,645	4,026
Excess of Receipts	516	532	-525	-404	180	172	276	-105	-357
Balance, End of Year	516	1,049	524	119	299	471	747	641	285

[1]Source: CBO, Highway Assistance Program, op.cit.

Exhibit A.3: Highway Program Levels for Trust Fund, General Fund, and All Programs, Measured by Authorizations, Obligations, and Outlays: Fiscal Years 1957-1977, In Millions of Dollars (continued)

1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	TQ	1977
2,800	3,000	3,400	3,800	4,000	4,000	4,055	4,055	2,650	3,050	3,050	1,710	3,250
1,030	1,050	1,050	1,050	1,575	1,653	1,917	2,064	3,016	3,546	3,964		3,699
3,830	4,050	4,450	4,850	5,575	5,653	5,972	6,118	5,666	6,596	7,014	1,710	6,949
358	441	600	449	604	809	515	631	717	687	850	107	995
4,188	4,491	5,050	5,299	6,179	6,462	6,488	6,750	6,383	7,283	7,864	1,818	7,943
3,044	2,897	3,222	3,538	3,470	3,419	3,418	2,733	3,034	4,162	2,138	604	3,420
1,006	881	1,010	1,122	1,321	1,242	1,677	1,535	2,305	3,753	2,577	1,096	3,765
4,050	3,778	4,232	4,660	4,791	4,661	5,095	4,268	5,339	7,915	4,715	1,700	7,185
370	351	418	442	495	549	596	585	509	566	544	196	836
4,419	4,129	4,649	5,101	5,286	5,211	5,692	4,854	5,847	8,481	5,259	1,896	8,021
2,979	2,977	3,207	3,148	3,286	3,454	3,467	3,394	3,017	2,902	3,435	856	2,950
986	996	964	1,003	1,092	1,231	1,223	1,417	1,582	1,941	3,086	902	3,197
3,965	3,973	4,171	4,151	4,378	4,685	4,690	4,811	4,599	4,843	6,521	1,758	6,147
235	282	348	382	434	481	548	528	528	572	589	155	615
4,200	4,255	4,519	4,533	4,812	5,166	5,238	5,339	5,127	5,415	7,109	1,912	6,762
3,924	4,455	4,427	4,690	5,469	5,725	5,528	5,912	6,675	6,774	6,000	1,689	7,302
3,965	3,973	4,171	4,151	4,378	4,685	4,690	4,811	4,599	4,843	6,521	1,758	6,147
-41	482	256	539	1,091	1,040	838	1,101	2,076	1,931	-521	-68	1,155
244	725	982	1,521	2,612	3,652	4,490	5,591	7,667	9,597	9,077	9,009	10,164

Railroad Rehabilitation and Improvements/Federal Railroad Administration, Department of Transportation

1. PWI functional area addressed in this study.

   - Railroads.

2. Conceptual category of need satisfied by this PWI program.

   - Promotion of commerce (primary).
   - Encouragement of economic development.
   - Protection of citizenry; defense.

3. Type of Federal program.

   - Grants-in-aid, as well as direct payments for specified use.

4. Authorizing legislation.

   - P.L. 94-210, Railroad Revitalization and Regulatory Reform Act of 1976, Title V.

5. Implementing rules and regulations.

   - 49 CFR, Part 260.

6. Program objectives.

   - To provide railroads with financial assistance for the rehabilitation and improvement of equipment and facilities or such other purposes approved by the Secretary.

7. Program scope.

   - Acquire, rehabilitate, maintain, and improve facilities and equipment. Eligible equipment and facilities include locomotives, freight cars, track and roadbed, as well as communication and power transmission systems, signal, yard, and terminal facilities and shop/repair facilities.

8. Year program was initiated and years when major changes were made.

   - In 1966 Congress enacted legislation requested by President Johnson creating a Department of Transportation. P.L. 89-670 established the 12th Cabinet-level department. Within the new Department three operating divisions were established, one of which was the Federal Railroad Administration.

- The Administrator was directed to exercise the Secretary's authority over an annual budget of $3.5 million. Functions included those related to protection of employees and travellers, explosives and other dangerous articles. Safety functions of the Interstate Commerce Commission such as inspection and enforcement of safety regulations for railroads and pipelines were to be carried out by the Federal Railroad Administrator.
- In 1970, President Nixon signed P.L. 91-458, the Federal Railroad Safety Act, standardizing railroad safety provisions in an attempt to reduce accidents, especially those involving hazardous materials. Railroads were the only member of the transportation industry not subject to comprehensive Federal safety regulations. The bill permitted the Secretary, through the Administrator, to prescribe safety regulations and permitted states to set standards more stringent than existing Federal regulations.
- The Emergency Rail Services Act of 1970 was signed by President Nixon on January 8, 1971. P.L. 91-633 authorized up to $125 million in Federal loan guarantees for the bankrupt Penn Central Railroad. Proceeds from loans guaranteed under this Act were required to be used solely for meeting payroll and other expenses necessary to centralize essential service. The Act required that the following findings be made by the Secretary of Transportation before the loan guarantees could be approved:
  - Cessation of essential transportation services by the railroad would endanger the public welfare.
  - Cessation of those services was imminent.
  - There was no alternative source of funds available.
  - The funds could not be obtained without the Federal guarantees.
  - The railroad could reasonably be expected to become self-sustaining.
  - The probable value of the assets of the railroad, in the event of liquidation, provided reasonable protection to the United States.
- In 1970, Congress completed action on a bill, P.L. 91-518, the Rail Passenger Service Act of 1970, creating a semi-public corporation to operate a nationwide railroad passenger system beginning May 1, 1971. The bill authorized $40 million in Federal grants to help establish the corporation and improve its equipment and facilities, and appropriated $100 million for loan guarantees. The Rail Passenger Service Act of 1970 created AMTRAK as a private, for-profit corporation to operate and revitalize intercity rail passenger service in the United States. The Federal financial assistance for AMTRAK is administered by the Federal Railroad Administration; the grants are made to AMTRAK to offset operating deficits.

- In June 1972, widespread devastation occurred along the eastern seaboard from Hurricane Agnes and from resulting severe floods. Among the railroads badly damaged by this national disaster were three major carriers in reorganization under the Bankruptcy Act--Penn Central, Reading, and Lehigh Valley--and one in the process of entering reorganization--Erie Lackawanna.
- At that time these railroads did not qualify for relief under the existing Federal disaster relief programs, and they had limited resources to invest in rehabilitation of facilities damaged by the floods. Responding to this need, the Congress enacted the Emergency Rail Facilities Restoration Act (P.L. 92-591) on October 27, 1972, authorizing the Secretary of Transportation to make loans to financially distressed railroads for restoring and replacing railroad facilities, equipment, and services which the Secretary determined to be essential to the public service and which were damaged by Hurricane Agnes.
- In June 1972, Congress cleared for the President's signature P.L. 92-316, which authorized $225 million in grants for the National Railroad Passenger Corporation (AMTRAK) through fiscal year 1973. The additional Federal subsidy was needed to continue rail passenger service as required by the Rail Passenger Service Act. The loan guarantee authority was increased to $200 million.
- Probably the most significant legislation for the Federal Railroad Administration was P.L. 93-236, which established a non-profit United States Railway Administration (USRA). USRA was to design a new rail system in the midwest and northeast, to issue loan guarantees to acquire and upgrade the system, and to set up a new corporation to run it under the Regional Rail Reorganization Act of 1975. In its several programs, there is joint administration by the USRA and Federal Railroad Administration. The Office of Rail Assistance Programs within FRA became responsible for implementing assistance programs under Section 215 of the Act. Section 215 provided $15 million for the acquisition, maintenance, or improvement of railroad facilities and equipment. In 1975, the Act was amended to allow the use of Section 215 funds to pay equipment obligations of the bankrupt railroads, helping them to relieve their cash crisis, and increased total authorization from $150 to $300 million.
- The Federal Railroad Administration has responsibility, under Section 213 of the Regional Rail Reorganization Act of 1973, to provide assistance grant funds to supplement the railroads' working capital position, as well as to rehabilitate rail facilities and equipment in order to insure continuation of essential services. The 1975 Amendments increased authorizations from $85 to $282 million.

- P.L. 93-90, passed in August 1973, authorized the Federal Railroad Administration to control the transportation of hazardous materials and to report to Congress on how transportation of hazardous materials through densely populated areas could be avoided.
- Congress passed legislation in December 1974 strengthening Federal transportation safety programs, especially in shipment of potentially hazardous materials. P.L. 93-633 preempted state and local requirements that were inconsistent with Federal regulations (see Federal Railroad Safety Act of 1970) and authorized $35 million for FRA's fiscal year 1975 railroad safety programs.
- In January 1976, Congress cleared the Railroad Revitalization and Regulatory Reform Act of 1976 (P.L. 94-210), which dramatically increased the amount of direct Federal financial assistance available. The Act provided financial assistance to railroads throughout the country with the intention of revitalizing the railroad industry rather than responding to specific crises and assistance. The 1976 Act authorized $6.4 billion in financial assistance to the railroad industry in the form of grants, loan guarantees, and purchases of preferred stock to provide the railroads with capital. About $1.6 billion will be available industrywide, with the remainder available primarily for the Consolidated Rail Corporation (Conrail) and Northeast Corridor improvement. The Federal Railroad Administrator is responsible for implementing and monitoring the $1.6 billion financial assistance program. Of this $1.6 billion, $600 million will be used to purchase equity in the railroads through the Railroad Rehabilitation Fund and $1 billion will be approved as guaranteed loans, used to acquire, rehabilitate, or improve railroad facilities and equipment.
- The Act requires that two major studies be completed. One requires that the FRA finalize standards for classification of main and branch lines and designate rail lines according to those standards. The second study is of capital needs, to be submitted to the FRA by the railroads, listing deferred maintenance and delayed capital expenditures as of December 31, 1975, accompanied by a projection of desired maintenance and capital expenditure for 1976-1986.
- In 1976, Congress strengthened the Federal Railroad Administration's existing safety programs. Under P.L. 94-348, the FRA was given additional authority to enforce Federal rail safety standards.

9. Type of Federal grant or loan mechanism.

- Discretionary funding.

10. Type of recipient.

- Applicant is defined to mean any railroad or other person, including state and local government entities; applicants must submit documentation supporting their status as a common carrier, trustee or other organization obligated for the payment of principal and interest on funds used.

11. Eligibility and application requirements for state and/or locality to receive Federal funds.

- Each year AMTRAK submits to the Transportation Department and the Congress a multiyear financial program (budget) consisting of operating plans and capital acquisition plans approved by AMTRAK's board of directors (which includes the Secretary of Transportation). As a part of its review of AMTRAK's budget and long-range planning, the Department considers the expected level of loan guarantees in the ensuing fiscal year and the intended use of the loan proceeds. After the Department completes its review of AMTRAK's financial program, the Secretary expresses his approval or disagreement with all or part of AMTRAK's capital plans. Therefore, when an application is submitted for a guarantee of an AMTRAK loan, the Department has already reviewed the general purpose and level of loan guarantees for the fiscal year.
- An application for loan guarantees is actually submitted to the Federal Railroad Administrator, who has been delegated the authority by the Secretary to guarantee AMTRAK obligations.
- Procedure for submitting loan guarantee applications are contained in Part 251 of Title 49 of the Code of Federal Regulations and require, among other things, that an application include:
  - A brief description of the loan and its purpose, and a summary statement of financial obligations to, or claims against, the United States.
  - Information as to the lender's organization and relationships to the applicant, and the circumstances and negotiations leading to the agreement by the lender to make the proposed loan.
  - Information demonstrating that the applicant has endeavored to obtain a loan upon reasonable terms without a guarantee but was unable to do so.
  - Twenty-one exhibits showing various organizational and financial data pertaining to AMTRAK operations and the proposed loans.
  - Certifications as to the validity of the transaction and information provided in the exhibits.
- The application must be consistent with the State Rail Plan previously submitted to the Department. Local and regional governments will have reviewed and commented on the elements of the State Rail Plan. The FRA regards the development of a

State Rail Plan as indispensible to an informed decision about where to best apply program funds; State Rail Plans are updated annually and assistance for planning is available from the Federal Railroad Administrator.

- Although the Federal Railroad Administration reviews all applications for loan guarantees to determine whether there is adequate evidence to support the required findings (see Section 8 above), it does not have formal procedures for systematically reviewing and approving applications to insure that the same evaluation criteria is applied to each application.
- Section 213 of the Regional Rail Reorganization Act of 1973, as originally enacted, authorizes the Federal Railroad Administration to provide emergency assistance grants to the trustees of railroads in reorganization -- Penn Central, Central of New Jersey, Erie Lackawanna, Reading, Lehigh Valley, Ann Arbor, and Lehigh and Hudson River -- to insure continuation of essential transportation services. Under the approved formal procedures for administering the section 213 program, FRA is responsible for:
  - Reviewing the financial information the railroads submit and making the analysis necessary to recommend the amount of assistance to be provided in the grant.
  - Analyzing expenditures to insure that only items consistent with the intent of Section 213 are recognized in determining cash deficits.
  - Monitoring the cash needs of grant recipients.
- Section 215 of the Regional Rail Reorganization Act of 1973, as originally enacted, provided funds for the acquisition, maintenance, or improvement of railroad facilities and equipment necessary to improve property that would be included in the final system plan. A primary determinant in the allocation of Section 215 funds and the magnitude of assistance provided to each railroad was in relationship to their role in the final system plan. (See table appended).

13. Factors used in determining the Federal allotment.

- Each project for which assistance is sought must satisfy a set of public benefit standards based upon national goals and objectives to qualify for funding. Public benefits and costs related to rail facility improvements encompass a wide range of values and are not easily quantified. Because of the multiplicity of project types, variations between applicants and their markets, and the difficulty of quantifying certain benefits and costs, consideration of public benefits and costs is accomplished through identification of broad categories of projects for which the public benefits exceed or will equal whatever monetary or social costs are involved, subject to an assessment of its environmental impact.

- The Federal Railroad Administrator gives priority (no weighting involved) to projects that:
  - Enhance the ability of the applicant carrier or other carriers to provide essential service (which may be measured by traffic density).
  - Are preferable to alternative service in terms of transportation economics and efficiency.
  - Are in the public interest, vis-a-vis furthering the goals of national transportation policy.

14. Agency or Congressional rationale for using this procedure and variables.

- Both the Congress and the Transportation Secretary (through the Federal Railroad Administrator) believe that the discretionary granting of loans and the grants-in-aid approach are the best mechanisms to cover the costs of: 1) rail service continuation; 2) rehabilitating and improving a rail line; and 3) reducing the cost of lost rail service in a less expensive way than continued rail service.

15. Degree to which states and localities influence project selection.

- As previously mentioned, states must complete a State Rail Plan. The application must describe the relationship of the specific project to the performance of the State Rail Plan. States are allocated funds not only for rail planning purposes, but also on the basis of percentage of rail mileage eligible for assistance located in the state to total national eligible miles.

16. Information on needs assessment requirements in authorizing program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- The 1976 Railroad Revitalization and Regulatory Reform Act requires that the Transportation Secretary undertake a national needs assessment to:
  - Show the potential cost savings and improvements that could result from restructuring the railroads.
  - Rehabilitate limited portions of the railway system deemed essential to interstate commerce and the national defense.
  - List in order of descending priority those rail properties which should be improved.
- As with other programs (most notably Farmers Home Administration), the needs assessment that is required from the local applicant varies from the needs assessment at the national level.

B. Is NA a precondition for grant, loan or direct Federal expenditure?

- Yes.

C. Does program provide additional grants-in-aid for conducting the NA?

- Yes. Section 402 of the 1973 Regional Rail Reorganization Act provides such funds during the state planning process.

D. Who conducts the NA?

- The states' plan is a needs assessment.
- The Transportation Department is presently concluding a needs assessment; presumably its results can be compared to the data found in the states' plans.

E. In what type of document is the NA contained?

- State Rail Plan.

F. How is need defined?

- Traffic density.
- Service provided on each rail line, by class of service.
- Description of importance of rail service to military installations.
- Characteristics of rail plant, equipment, and facilities condition.
- Benefits and costs, in terms of economic, social, environmental and energy, of use of alternate modes of transportation.

G. What technique is to be used for conducting the NA, i.e., measuring the need?

- Expert opinion and judgment is used in the formulation of the State Rail Plan. The Transportation Secretary expects to be informed as to the data sources, assumptions, analytical methodology, and other special conditions essential to understanding the development of the State Rail Plan.

H. What are the key factors (variables) to be considered in doing the NA?

- Safety.
- Travel time.
- Capacity (volume/capacity ratio).

- Productivity (vehicle miles of travel).
- Energy consumption.
- Displacement (highway acres, jobs lost).
- Environmental (air quality, trucks vs. rail).

I. With what frequency is the NA to be performed.

- To be revised annually to reflect such changes as those in constitutional or legislative position of the state rail agency or identification of lines and services that have been discontinued or abandoned.

17. Strengths and weaknesses.

- The program administered by the Federal Railroad Administration is a component of the larger Federal effort to shore up the nation's faltering railroads. The bulk of Federal capital assistance to the railway system was precipitated by a swife succession of railroad bankruptcies. Government assistance related to the financial rescue of the railroads includes heavy outlays for which there is little prospect of recovery; the Secretary of Transportation's October 1978 report to Congress estimated that $13.1 billion to $16.2 billion would be needed over the ten year period 1976-85. The study did not specify the extent to which the government would be asked to fund this "capital shortfall."
- National transportation policy is the outcome of numerous, highly specialized, but largely uncoordinated decisions regarding the nation's diverse transportation system. Many of the changes and challenges of transportation finance reflect shifts in the nation's growth and attitudes. Because of the uncertainty about the proper Federal role with respect to some modes, there is no consensus about the needs of each for Federal assistance -- this is as true for the nation's highway network as it is for the intercity rail system.

18. Information on Federal funding for the PWI program.

- As of 12/31/78, $711 million in applications were received and $87 million in agreements were made. (See Exhibits A.4 and A.5, attached).

19. Primary data sources for completing summary sheet.

- Congress and the Nation, Volumes I through IV.
- Federal Railroad Administration Manuals:
  - November 2, 1978 Memorandum from the Office of the Administrator to All Participating States.
  - Testimony presented to the U.S. House of Representatives Appropriations Committee, 1978.
  - Title 49 of the Federal Code of Regulations, Part 260.

- General Accounting Office Reports:
  - Information on Loan Guarantee Programs Under the Rail Passenger Service Act and The Regional Rail Reorganization Act, February 1975.
  - Improved Controls Needed Over Federal Financial Assistance to Railroads, November 1976.
  - Analysis of Amtrak's Five Year Plan, March 1978.

Exhibit A.4: Railroad Revitalization and Regulatory Reform Act of 1976 Applications Received and Agreements Executed As Of December 31, 1978

($ in millions)

By Applicant	Obligation Guarantees Application(s)	Agreement(s)
Chicago, Milwaukee, St. Paul and Pacific Railroad Company	$ 21.4	$ 21.4
Chicago and North Western Transportation Company	576.6[2]	17.6
Columbus and Greenville Railway		
Chicago, Rock Island and Pacific Railroad Company	88.2[1]	33.5
Illinois Central Gulf Railroad Company		
Boston and Maine Corporation		
Peoria and Pekin Union Railway Company		
Missouri-Kansas-Texas Railroad Company	16.5	16.5
Delaware and Hudson Railway Company	8.0	8.0
Utah Railway Company		
TOTAL	$710.7	$97.0
By Type of Project		
Facilities	$564.0	$19.8
Equipment -	146.7	77.2
TOTAL	$710.7	$97.0

[1] 2 applications

[2] 4 applications

Exhibit A.5: Section 511, Railroad Revitalization and Regulatory Reform Act of 1976, Applications Received As of December 31, 1978

APPLICANT	DATE OF APPLICATION	AMOUNT OF ASSISTANCE REQUESTED	DOCKET NUMBER	DESCRIPTION OF PROJECT
1. Missouri-Kansas-Texas Railroad Company	10/27/76	$ 16,500,000 1/	RFA 511-76-1	Rehabilitate and improve main line between Durant, Oklahoma and Whitesboro, Texas and between Fort Worth, Texas and Waco, Texas. Also, between Bellmead and Temple, Texas.
2. Chicago, Milwaukee, St. Paul and Pacific Railroad Company	12/21/76 2/	21,419,377 2/	RFA 511-76-2	Repair of freight cars and locomotives; pollution control facilities - Milwaukee shops.
3. Chicago, Rock Island and Pacific Railroad Company	12/--/76	7,239,808	RFA 511-76-3	Rehabilitation and improvement of main line between Memphis, Tennessee and Little Rock, Arkansas (ties and surfacing).
4. Chicago and North Western Transportation Company	02/23/77	17,600,000 3/	RFA 511-77-1	Repair of freight cars.
5. Chicago, Rock Island and Pacific Railroad Company	05/24/77	81,000,000	RFA 511-77-2	Repair of freight cars; acquisition of cars and locomotives; locomotive repair and rebuilding.
6. Delaware and Hudson Railway Company	12/05/77	7,962,067 4/	RFA 511-77-3	Refinancing of 20 locomotives presently under D&H-USRA conditional sale agreement.
7. Chicago and North Western Transportation Company	08/15/78	531,894,000	RFA 511-78-1	Rehabilitate or construct 625 miles of railroad in Wyoming and Nebraska for transportation of low sulphur coal from Southern Powder River Basin in Wyoming.
8. Chicago and North Western Transportation Company	08/14/78	6,205,902	RFA 511-78-2	Aggregate reusable material value generated in the rehabilitation project otherwise financed under section 505 in RFA 505-78-1.
9. Chicago and North Western Transportation Company	11/9/78	$ 20,905,789	RFA 511-78-3	Rehabilitation of freight cars-second stage.
Total		$710,726,943		

FOOTNOTES:

1/ Application increased to $16,500,000 on April 17, 1978 to cover track rehabilitation between Bellmead and Temple, Texas.

2/ Originally submitted as an application for a commitment to guarantee ($17,750,368), to cover installation of CTC system and purchase of maintenance of way equipment and ballast cars; utilization of commitment, if any, contingent upon approval of separate application under section 505 filed on 12/21/76. Adjusted to reflect revised project proposals dated September 7, 1977 submitted by Milwaukee under Docket No. RFA 511-76-2 to take the place of the original submission as follows: repair of locomotives ($12,780,000); repair of freight cars ($5,343,031); and pollution control facilities at Milwaukee Shops ($1,510,210). Further adjusted to reflect revisions following section 77 proceedings.

3/ Originally submitted as $16,000,000. Adjusted to reflect amount of financing which was negotiated and incorporated in Financing Agreement dated March 8, 1978.

4/ Application increased to $7,962,067 on February 7, 1978.

Urban Mass Transportation Capital Improvement Grants and Loans/Urban Mass Transit Administration, Department of Transportation

1. PWI functional area addressed in this study.

   - Mass transit.

2. Conceptual category of need satisfied by this PWI program.

   - Improve the quality of life (primary).
   - Promotion of commerce.
   - Equity considerations.

3. Type of Federal program.

   - Project grants and direct loans.

4. Authorizing legislation.

   - P.L. 88-365, Urban Mass Transportation Act of 1964 (49 U.S.C. 1601).

5. Implementing rules and regulations.

   - 49 CFR 601.2.
   - "Program Information for Capital Grants and Technical Studies Grants."
   - "Guidelines for Project Administration."

6. Program objectives.

   - To assist in financing the acquisition, construction, reconstruction, and improvement of facilities and equipment for use by operation, lease, or otherwise in mass transportation in urban areas and a coordinating service with highway and other transportation in such areas.

7. Program scope.

   - Acquisition, construction and/or reconstruction of facilities and equipment.

8. Year program was initiated and years when major changes were made.

   - By 1960, it became apparent that mass transportation offered an economical solution to the increasing congestion of many downtowns caused by automobile commuting. In the 1961 Housing Act (P.L. 87-70), Congress authorized assistance to state and local governments to meet mass transit problems.

Title III set aside $25 million for Federal grants to local agencies to cover two-thirds of the cost of mass transportation demonstration projects; Title II earmarked $50 million for low-interest loans to metropolitan agencies for construction of mass transportation systems; and Title IX provided urban planning assistance for transportation.

- In his Transportation Message of April 5, 1962, President Kennedy recommended that Congress "authorize the first installment of a long-range program of Federal aid to our urban regions for the revitalization and needed expansion of public mass transportation to be administered by the Housing and Home Finance Agency".
- On February 18, 1963, President Kennedy submitted to Congress his draft Urban Mass Transportation Act -- essentially the same as that submitted in 1962. The bill set forth three purposes: 1) to assist in the development of improved mass transit; 2) to encourage planning and establishment of area-wide urban mass transportation systems; and 3) to provide assistance to state and local governments in financing such systems.
- The Urban Mass Transportation Act of 1964 (P.L. 88-365) was supported by President Johnson in his Budget Message of 1964. The law authorized the Administrator of Housing and Home Finance Administration to not only make grants and loans to states and localities for acquiring, constructing, and improving facilities and equipment for mass transit, but also to provide housing for the families dislocated by the project. Up to $75 million of grants were authorized in fiscal year 1965 and $150 million in the subsequent two fiscal years. The $50 million low interest loan program (which expired June 30, 1963) was extended indefinitely. Matching grants were to be extended to cover two-thirds of the total project cost which could not be financed from system revenues (fare box).
- Though P.L. 89-670 created the Department of Transportation in 1966, the urban mass transit programs, administered by the Department of Housing and Urban Development, remained under the Office of Metropolitan Development pending further study of its logical place in the Executive Branch.
- P.L. 89-562 of 1966 sustained authorizations for the next three fiscal years at $375 million but expanded the 1964 Act by granting funds for planning and technical studies prior to construction or improvement of mass transit systems. These new grants were to cover two-thirds of the costs of planning, engineering, and designing activities. The 1966 amendments directed the Secretaries of HUD and Commerce to submit a program in 18 months to deal with new transit systems in metropolitan areas of various sizes.

- In May 1968, President Johnson's Reorganization Plan Number Two shifted urban mass transit programs from the Department of Housing and Urban Development to the Transportation Department. $190 million was authorized for urban mass transit programs in fiscal year 1970.
- On October 5, 1970, Congress cleared a bill authorizing $3.1 billion for five years in grants and loans for state and local governments for mass transit projects. The bill was similar to President Nixon's 1969 proposal to "make public transportation an attractive alternative to private car use". P.L. 91-453 reaffirmed the two-thirds net cost principle and authorized $3.1 billion after fiscal 1975; $3.1 billion was authorized through fiscal 1975. In keeping with the National Environmental Protection Act, the Secretary of Transportation found that the proposed project was the best alternative in terms of protecting the environment. Another provision of P.L. 91-453 was that the Secretary was authorized to conduct a one-year study of the feasibility of providing Federal subsidies for operating costs of mass transit systems.
- Title III of the Federal-Aid Highway Act of 1973 (P.L. 93-87) increased to 80 percent the Federal share of urban mass transit capital grants. Contract authority under the 1964 Act was increased to $6.1 billion from $3.1 billion. The 1973 Federal-Aid Highway Act allows states to substitute mass transit projects for certain highway projects; these mass transit projects may be substituted for sections of the Interstate Highway System.
- In 1973, both the House and Senate passed but did not clear legislation authorizing $800 million for fiscal years 1974-1975, to provide operating subsidies, for the first time, to urban mass transit systems. This came after the jarring energy crisis of 1973-74 forced the nation to scrutinize the efficiency of its transportation systems and after the realization that low ridership was crippling urban mass transit systems.
- P.L. 93-503, signed by President Nixon in 1974, authorized $11.9 billion over six years to help the nation's financially troubled urban mass transit systems meet their increasing operating and capital expenses. This was deemed a significant step in assuring the continuing vitality of mass transportation.
- Of the $11.9 billion authorized for fiscal years 1975 through 1980, $7.3 billion was made available to urbanized areas for mass transportation capital and other projects, with $500 million of this amount reserved for rural areas (those under 50,000); the Federal government would pay up to two-thirds of the cost of such projects. Additionally, an "alternate use fund" was established of $3.975 billion for either operating or capital expenses in "urbanized" areas to be apportioned as follows: half of the basis of local population

to state population and half according to population density of the local area. These funds were to be denied to applicants requesting money after July 1, 1976 if they had not developed a long range, multi-mode transportation plan.

- The Railroad Revitalization and Regulatory Reform Act of 1976 (P.L. 94-210) authorized a total of $125 million under the Urban Mass Transportation Act for fiscal years 1976-78 to assist local governments in making subsidy payments to continue commuter rail passenger services with the Federal share ranging from 100 percent to 50 percent over two years.

9. Type of Federal grant or loan mechanism.

   - Both project grants and direct loans, which are approved, on a discretionary basis, by the Administrator of UMTA.

10. Type of recipient.

    - Public agencies or private transportation companies through contractual arrangements with the public agency.

11. Eligibility and application requirements for state and/or locality to receive Federal funds.

    - Applications for capital grants and loans are prepared and submitted in two stages -- a preliminary application, which allows UMTA to judge the probable eligibility of the applicant, and a final application, in which legal, engineering, and technical data are detailed. The programs considered by the grant and loan application must be consistent with the comprehensive transportation plan for the development of the urban area via both the highway and urban mass transit network. The governor of the state shall be apprised of the proposed project, especially if there is a statewide comprehensive planning effort.

12. Federal funds allotment procedures.

    - Section 3 of the 1964 Urban Mass Transportation Act provides capital facilities grants to state and local public agencies to assist in financing the acquisition, construction, reconstruction, and improvement of physical facilities for mass transportation service in urban areas. Section 5 of the original 1964, as amended by the National Mass Transportation Assistance Act of 1974, awards grants for operating costs of maintaining and improving public transportation, as well as for the capital costs of acquiring, constructing, and improving mass transit facilities and equipment.

Section 3 grants or loans are made on a discretionary basis. Capital assistance grants are awarded for 80 percent (prior to July 1, 1973, Federal assistance was limited to two-thirds) of the total project cost and loans can be made up to 100 percent of the project cost. UMTA awards these assistance funds after a determination that sufficient Federal funds are available, and that all statutory and administrative requirements have been met. These requirements relate to such factors as a determination of applicant needs, protection of other transit systems, development of adequate transit plans, environmental impact, public hearings, employee protections, and civil rights assurances. Two-thirds of all UMTA funds are discretionary.

- Section 5 funds are to be used to not only make capital purchases, but also to meet the day-to-day operating costs of running the transit system. $3.975 billion is to be spent in the six-year 1975-1980 period, alloted to the states on a (statutory) formula based on population density. The apportioned funds are dispensed by the state to urbanized areas of more than 200,000 population; the governor dispenses the funds to the smaller urbanized areas. Generally, the transit systems in urban areas with over 200,000 populations used Section 5 funds exclusively to offset operating deficits, while transit systems in urban areas under 200,000 population have used Section 5 funds not only to offset operating deficits, but also to purchase capital items that have led to increased kinds of service.

13. Factors used in determining the Federal allotment.

- The criteria used in awarding Section 3 discretionary grants and loans vary in terms of the size of the system (which is a function of population) to be assisted. However, before detailing the criteria used by system size, the common criteria considerations for all discretionary funds are: 1) will the assistance prevent cessation of services; 2) will UMTA funds reduce traffic congestion; and 3) will the project demonstrate the non-capital intensive means by which traffic congestion can be reduced (synchronized traffic lights, price adjustments to vehicular facilities -- decrease bus fares and increase bridge tolls during rush hours, etc.). Criteria vis-a-vis system size are:
  - Small Systems Category (urban areas with a population under 250,000).
    - -- Probable immediate and longer term impact of maintaining or increasing potential bus ridership.
    - -- Proposed changes in service level.
    - -- Effects of changes in service level on revenues (fare box), narrowing of operating deficits, and improved capital position.
    - -- Age and condition of present vehicles.

-- Deviation of the applying system from the norms for a number of operating measures (average cost per vehicle-mile, average cost per vehicle-hour, average cost per passenger-mile, etc.).

- Medium System Category (urban area between 250,000 and 1,000,000 population).
  -- Effects on traffic congestion.
  -- Effects on transit ridership.
  -- Criteria above in Small System Category.
  -- Relationship of the proposed project to comprehensive metropolitan regional transportation plan.
  -- Improvements caused by the project vis-a-vis higher peak-hour travel speeds and a lower volume-to-capacity ratio during peak travel hours.
- Large System Category (metropolitan area with over 1,000,000 population; rail projects are placed in this category).
  -- Increase the use of public transit.
  -- Improve quality of urban development.
  -- Improve quality of urban environment.
  -- Effect on efficiency of current facilities and equipment.
  -- The benefits of the proposed project vis-a-vis alternatives.
  -- Meets criteria in the Medium Size Category.
  -- Comprehensiveness in terms of alternative transportation modes and land use patterns.
  -- Proposed project is consistent with all major development and redevelopment projects.
  -- Proposed project is environmentally preferable to alternatives.
  -- Improvements in efficiency as measured by increases in passenger-miles per man-year and increases in passenger miles per day.
- Section 5 funds are awarded to urbanized areas on a statutory apportionment basis. Under the formula, urbanized areas are entitled to receive an amount equal to the sum of one-half of the total amount multiplied by the ratio of the urbanized area's population bears to total urbanized area of all states and one-half of the total amount multiplied by a ratio for that urbanized area determined on the basis of population weighted by a factor of density (inhabitants per square mile).

14. Agency or Congressional rationale for using this procedure and variables.

- Congress and the Urban Mass Transit Administration believe that this approach to apportioning Federal aid has successfully halted the rapid deterioration of urban public transportation services and has increased ridership. Antiquated

equipment and facilities have been replaced. Moreover, the Federal transit aid programs have had positive impacts in the cities and older regions by using the investment as a tool of community development and central city revitalization and strengthening the economic vitality of downtown areas.

15. Degree to which states and localities influence project selection.

- Section 3 grants are discretionary funds, awarded to individual applicants.
- Section 5 funds are awarded to the states or urban areas.
- The recipient of the Advisory Commision on Intergovernmental Relation's 1975 survey suggested that greater consideration be given to a locality's financial capacity when grants are awarded. Further, the UMTA Administrator was very critical of the lack of technical assistance given to grant recipients; less criticism was leveled at the recipient for not coordinating with other state and local activities. The regional offices have considerable authority, since they approve and disapprove potential recipients' plans and assess the program's overall effectiveness.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- The 1964 Urban Mass Transportation Act requires a needs assessment "based upon a continuing, cooperative, and comprehensive planning process covering all modes of surface transportation, and carried on by states and the governing bodies of local communities."
- Title 23 of the U.S. Code of Regulations requires that the urban transportation planning process provide for the long-range transportation needs of the urbanized area.

B. Is the NA a precondition for grant, loan or direct Federal expenditure?

- Yes.

C. Does program provide additional grants-in-aid for conducting the NA?

- Yes, under Section 9 of the Act.

D. Who conducts the NA?

- The locality, usually, conducts the assessment which should complement the state plan.

E. In what type of document is the NA contained?

- Project Plan, submitted to either UMTA (discretionary funds) or the governor (apportioned funds).

F. How is need defined?

- The criteria for eligibility for discretionary funds have been described, above.
- States' criteria vary, but generally conform to the requirements of the Act.

G. What technique is to be used for conducting the NA, i.e., measuring the need?

- Mostly expert opinion and judgment, since planning standards, efficiency and effectiveness are in the early stages of development.

H. What are the key factors (variables) to be considered in doing the NA?

- Prevention of cessation of service.
- Reduction of traffice congestion.
- Demonstration of non-capital intensive alternatives.
- Conservation of natural resources and the environment.
- Minimize disruption of desirable community development and growth.

I. With what frequency is the NA to be performed?

- On a project-by-project basis, though communities must submit follow-up reports.
- Apportioned monies by the state must be based on continuing comprehensive transportation planning process approved by the Administrator of Urban Mass Transportation.

17. Strengths and weaknesses.

- The Administrator of Urban Mass Transit is authorized to issue regulations requiring efficiency improvements in transit services. Specific mass transit efficiency measures, which are an indicator of an area's transportation needs, have not yet been developed. Efficiency and effectiveness, the two principal concepts that UMTA uses in assessing needs, are two quite different concepts. Efficiency is concered with the costs of providing service and the relationship of service outputs to resource inputs, as measured by cost per passenger and cost per vehicle mile. Effectiveness relates to the quality of service provided, and considers the amount of service provided and user convenience, and is measured by ridership and vehicle miles of service.

- Section 121 of the Federal Aid Highway Act of 1974 encouraged the development, improvement, and use of mass transportation systems in urban areas by allowing highway trust fund monies for Urban System Mass Transit projects. For fiscal years 1974-1976, about $2.3 billion of Urban System funds were authorized for mass transit and highway projects. As of June 30, 1976, about $73.7 million (3 percent of the $2.3 billion authorized) was obligated to urban mass transit while $1 billion (45 percent) was obligated for urban highways; the balance was either transferred to other highway programs or remained unobligated. In funding transportation projects, communities tend to seek programs which require the least local matching funds. The Federal share of Urban System Highway and Mass Transit projects ranges from 70 to 95 percent, depending upon the amount of public land in each state, but remains a flat 80 percent for UMTA capital grants. Differences in the proportion of local matching funds required provide communities incentives to use urban system funds for highways and UMTA grants for mass transit; for 42 states, Federal cost-sharing ratios are greater under the UMTA program than they are under the Urban System program, thereby requiring less local money to fund UMTA projects. The thrust of the 1973 Federal Aid Highway Act and the "alternatives" requirement of the Urban Mass Transportation Act of 1974 may boost program planning to consideration of overall needs.

18. Information on Federal funding for the PWI program.

- On a cumulative basis, only 20 percent of the appropriated Section 3 discretionary funds have actually been disbursed. Since 1964, some $23 billion have been appropriated for the capital facilities grants to state and local public agencies to assist in financing the acquisition, construction, reconstruction, and improvement of physical facilities for mass transportation service in urban areas.
- Over the 14-year period during which UMTA has operated, nearly $13 billion has been appropriated for Section 5 purposes. It must be remembered that the 1974 National Mass Transportation Assistance Act authorized $4 billion for six years; it is not possible from the available data to disaggregate what amount was budgeted for grants awarded to urban areas on the basis of a statutory apportionment formula during the four-year overlap period.
- Only 38 percent of the appropriated Section 3 dollars have been obligated by the states. The performance of actual spending of Section 5 monies was better -- nearly 50 percent had been spent.

19. Primary data sources for completing summary sheet.

- Urban Mass Transit Administration publications:
  - Federal Assistance for Urban Mobility, May 1976.
  - Urban Mass Transportation Act and Related Laws.
  - The UMTA External Operating Manual, as revised.
  - Summary of UMTA Activity by State and Fiscal Year.
- Congress and the Nation, Volumes I through IV.
- GAO Reports.
  - U.S. Transportation System - Federal Government's Role, October 22, 1975.
  - Opportunities for Improving the Effectiveness of Rapid Transit Grants, March 10, 1976.
  - Why Urban System Funds Were Seldom Used for Mass Transit, March 18, 1977.
  - The Effect of Federal Formula Assistance Grants, April 25, 1978.
  - Making Future Transportation Decisions, March 16, 1978.
  - Transportation Issues, October 10, 1978.

Water and Waste Disposal Systems for
Rural Communities/Farmers Home Administration,
Department of Agriculture

1. PWI functional areas addressed in this study.

   - Water supply and distribution.
   - Sewer lines and treatment plants.

2. Conceptual category of need satisfied by this PWI program.

   - Protection of citizenry: public health (primary).
   - Encourage economic development.
   - Improve quality of life.

3. Type of Federal program.

   - Project grants.

4. Authorizing legislation.

   - Consolidated Farm and Rural Development Act, Section 306, P.L. 92-419.
   - 7 U.S.C. 1976.

5. Implementing rules and regulations.

   - 7 CFR 1933, Subpart A (loans).
   - 7 CFR 1823, Subpart B (grants).

6. Program objectives.

   - To provide basic human amenities, alleviate health hazards and promote the orderly growth of the nation's rural areas by meeting the need for new and improved rural water and waste disposal systems.

7. Program scope.

   - Funds may be used for the installation, repair, improvement, or expansion of a rural water system including distribution lines, wells, pumping facilities, and costs. The installation, repair, improvement, or expansion of a rural waste disposal system, including the collection and treatment of sanitary, storm and solid wastes.

8. Year program was initiated and years when major changes were made.

   - On April 30, 1935, President Roosevelt by Executive Order created the Resettlement Administration to deal with some

of the farm problems created by economic depression and dust-bowl conditions. In 1937, the Resettlement Administration was succeeded by a new agency, the Farm Security Administration, which took over not only resettlement and rural rehabilitation, but also became responsible for the Water Facilities Act program. The Farm Security Administration, after reorganization in 1946, as the Farmers Home Administration, was given another new program to administer: The Small Watersheds Loan Program (1956).

- The Water Facilities Act of 1937 was considerably expanded in 1954. Instead of being limited to the 17 western states and to water storage and utilization, the program was expanded to cover the continental U.S., Alaska, Hawaii, Puerto Rico, and the Virgin Islands, and take in soil conservation practices. President Eisenhower requested the changes which were included in P.L. 83-597.
- In 1956, the small watersheds program was broadened by P.L. 84-1018. Instead of being limited to flood prevention and water management projects, the program was extended to cover projects that included municipal and industrial water supply, recreation, fish and wildlife improvement, and pollution abatement. The Farmers Home Administration would make loans to local participants for their share of the projects, with loans limited to 50 years and interest rates based on the rate paid by the government on outstanding government securities.
- At the Kennedy Administration's request, a number of changes were made to various Farmers Home Administration loan programs. By way of the Food and Agriculture Act of 1962 (P.L. 87-703), the repayment of loans to local agencies under the Small Watersheds program could be deferred, interest-free, for up to 10 years, if the loan was made for the purpose of building in extra capacity to meet future needs for storage of water for municipalities and industrial users.
- President Johnson, in his 1965 Budget Message, called for the enactment of legislation that would provide Federal and regional coordination of plans for water resource development. P.L. 89-80, called the Water Resources Planning Act, established the Water Resources Council. The Council, composed of the Secretaries of Interior, Agriculture, Army, HEW, and the Chairman of the Federal Power Commission, was to evaluate regional and river basin plans in relation to water needs, and coordinate the administration of Federal water programs.
- In 1965, P.L. 89-240 authorized $50 million annually, in matching grants, to soil and water associations and local public agencies for construction of water supply and sewage disposal systems in rural areas of less than 5,500 population. The statute not only limited the Federal share to no more than 50 percent of the cost of the project, but also authorized an additional $5 million a year in grants to help public agencies prepare comprehensive plans for development of water supply or sewage disposal systems in rural areas.

- P.L. 90-488 of 1968 amended the Consolidated Farmers Home Administration Act of 1961 by increasing to $100 million from $50 million the maximum annual amount of matching grants which the Farmers Home Administration could make to local public agencies for construction of water supply and sewage disposal systems in rural areas where population did not exceed 5,500. Further, it increased to $15 million from $5 million the annual amount of grants that Farmers Home could make to public agencies preparing plans for water supply and sewage disposal systems.
- President Nixon signed the Rural Development Act on August 30, 1972. The Act provided for expansion of various existing programs and authorized numerous new programs. The Act increased the Farmers Home Administration's Water and Waste Disposal Grant ceiling to $300 million from $100 million. Title I of P.L. 92-419 also established planning guidelines for grants to require that proposed projects serve areas not likely to decline in population, were adequate to meet growth, and were consistent with community development and multi-jurisdictional plans. Grants directed at inadequate rural water and sewer systems in areas of less than 5,500 population were given top priority.
- On January 10, 1973, President Nixon terminated the rural water and sewer grant program. The Congress was unable to override the President, who had terminated the program for budgetary reasons, claiming that with farm income rising, rural communities had more money to spend on water and sewer systems, and required little Federal assistance.

9. Type of Federal grant or loan mechanism.

- Formula/project grants. The Farmers Home Administration makes grants when the development costs of a system will result in high charges to users. Grant assistance is provided to reduce the applicant's project costs to a level which will permit a reasonable user charge that will be comparable to user charges of established systems of similar size and costs in communities with similar economic conditions.
- Directly insured loans. Loans are made to public and nonprofit associations to finance the improvement and/or construction of water and sewer systems which primarily serve farmers, ranchers, farm tenants, laborers, and other rural residents.

10. Type of recipient.

- Loans and grants may be made to any public or nonprofit association. Applicants for water and waste disposal loans must be unable to obtain the needed funds from commercial or private credit sources at reasonable rates and terms.

11. Eligibility and application requirements for state and/or locality to receive Federal funds.

- Applications for Farmers Home Administration assistance are made at the county office serving the area in which the projects will be located. The county supervisor investigates the application, verifies the information contained in the application, and determines whether the applicant is eligible for assistance.
- The county supervisor provides applicants with technical guidance, the extent of which is determined by the individual applicant's problems and needs. The state office determines that instructions are carried out.
- Applicants must certify that they are unable to obtain sufficient credit elsewhere at reasonable rates and terms. Farmers Home Administration requires its state office to determine the availability of credit elsewhere for each applicant and to request those applicants for which credit elsewhere appears available to apply for such credit. Those applicants requested to seek credit elsewhere must provide the Administrator with evidence that credit elsewhere is not available before the Farmers Home Administration will continue to process the loan request.
- The Farmers Home Administration direct and insured loan program differs from the usual government insured loan program in that the administration handles all details of making the loans, including locating funds, processing applications, supervising borrowers' operations and servicing accounts. The only significant difference between direct loans and insured loans is that funds for direct loans are obtained from the Treasury and funds obtained for insured loans are obtained initially from the public.
- In order to qualify for a grant, an applicant must demonstrate that the development costs of a system will result in high user charges. Grant assistance is provided to reduce user charges to a reasonable level. The applicant must also insure that a minimum number of users will use the system.

12. Federal funds allotment procedure.

- Block grant and formula allocation to states.

13. Factors used in determining the Federal allotment.

- Before December 1973, the Farmers Home Administration allocated water and waste disposal funds by discretion, considering: 1) towns with a population under 5,500 without, and in need of, water and sewer systems; 2) rural population; 3) rural income; and 4) applications received in the previous years.

- The allocation system was revised in 1973 and first used to allocate fiscal year 1974 funds. The revised approach distributed $20,000 of water and waste disposal funds to each state and allocated the remaining funds by formula which considered each state's proportion of the total U.S. population in the open country and towns of less than 10,000 outside urban areas, as well as each state's rural per capita income. The population and income factors are weighted two to one, respectively.
- For fiscal year 1978, Farmers Home Administration revised its allocation formula by substituting the number of poverty households in rural areas and cities outside urban areas with populations of 2,500 to 10,000 for rural per capita income. Rural population and poverty households are weighted 50-50. States requiring funds in excess of their allocated amounts may receive additional funds through subsequent allocations from the national office reserve (about 10 percent of total funds authorized) and by transfers from other states.

14. Agency or Congressional rationale for using this procedure and variables.

- The Consolidated Farm and Rural Development Act authorizes the Secretary of Agriculture to make loans and grants to finance the improvement or construction of projects in rural areas to serve farmers and rural residents. The Act defines rural area as any area in a city or town that has a population of less than 10,000. The Act requires that the highest priority be given to rural communities with a population of less than 5,500.

15. Degree to which states and localities influence project selection.

- The state offices, each headed by a state director, are responsible for administering all Farmers Home Administration programs and activities in one or more states and for supervising county operations. State offices provide program supervision and management assistance to the county offices. The county offices make and service loans and grants at the local level and provide technical guidance to the borrowers.
- The locality, with the assistance of the state office of the Farmers Home Administration, includes information on its application that includes data on: 1) whether funding practices meet established priorities; 2) the financial aspects of the borrower; 3) problems experienced by the borrower; and 4) the borrowers eligibility to refinance this loan through private credit sources. The state director has responsibility to review applications in light of established priorities of the legislation and regulations.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- The components of needs assessment are clearly stated in the authorizing legislation and used by Farmers Home Administration in the allocation process.

B. Is NA a precondition for grant, loan or direct Federal expenditure?

- Yes. However, the needs assessment criteria used in distributing monies state-by-state are different from the needs information that the applicant provides the state office (namely, the proportion of rural population and poverty households). The funds allocation criteria is different from the application criteria of financial need.

C. Does the program provide additional grants-in-aid for conducting the NA?

- Yes. The Farmers Home Administration operating budget provides for a Planning and Technical Assistance staff.

D. Whoe conducts the NA?

- The applicant, with the assistance of the county office of the Farmers Home Administration, completes and files a form that clearly states the financial need. The needes assessment is conducted by the National Office on a state-by-state basis.

E. In what type of document is the NA contained?

- Project application.

F. How is need defined?

- Traditionally, the applicant defines the need in terms of the financial situation, e.g., inability to finance the proposed project from own sources or through commercial creditors at reasonable rates and terms. Evidence that the applicant has sought credit elsewhere must be presented to Farmers Home Administration officials.

G. What technique is to be used for conducting the NA, i.e., measuring the need?

- Not applicable.

H. What are the key factors (variables) to be considered in doing the NA?

- That a rural community be financially needy, as shown to the county and state officials as evidence that the applicant's bonds were offered on the open market and did not sell.

I. With what frequency is the NA to be performed?

- Project-by-project basis.

17. Strengths and weaknesses.

- A recurrent complaint of the General Accounting Office regarding the Farmers Home Administration's present method of allocating funds is that it does not consider each state's individual need. Consequently, some projects cannot be funded until other appropriated but unobligated funds become available.
- The Farmers Home Administration is concluding a survey of all community facilities in rural areas. The survey involves the inventory of present facilities and identifies the need for such facilities. The identification of need on a state-by-state basis will allow the Administrator to identify priority projects both nationally and locally, as well as reduce the subsequent adjustments to states' funding levels.

18. Information on Federal funding for the PWI program.

- One of the bases for amounts requested by FmHA is the number of loan and grant/loan applications received yearly. Over time, the FmHA has been able to develop a data base which allows it to assign an average value to each application. Dollar value of each application submitted, multiplied by receipts projected to be received, provides an estimate to request.
- The FmHA allocation process is the first phase for distributing appropriated monies. The second phase occurs twice during a fiscal year when the national office pools unobligated waste disposal loan funds. These funds are added to the national office reserve fund to be used for subsequent allocations. This is an effective means of using all available funds and gives them to states that can use them.
- Data on amounts obligated by states (both loans and grants) are contained in Exhibits A.6 and A.7, attached.

19. Primary data sources for completing summary sheet.

- Congress and the Nation, Volumes I through IV.
- Farmers Home Administration, Use of Resources Report, September 1976.
- Farmers Home Administration, Community Program Statistics, January 1978.
- GAO Reports.
  - Audit of the Farmers Home Administration, August 1958.
  - Financial Feasibility of Rural Water and Sewer Systems, April 1971.
  - The Farmers Home Administration's Water and Waste Disposal Program, September 1977.
  - Management of the Farmers Home Administration Water and Waste Disposal Program, March 1978.

UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Exhibit A.6:--TOTAL WATER AND WASTE LOANS: LOANS OBLIGATED BY STATES, FISCAL YEARS 1940-1975 1/

STATE	1940 INITIAL NUMBER	1940 INITIAL AMOUNT DOL.	1940 TOTAL NUMBER	1940 TOTAL AMOUNT DOL.	1941 INITIAL NUMBER	1941 INITIAL AMOUNT DOL.	1941 TOTAL NUMBER	1941 TOTAL AMOUNT DOL.
U.S. TOTAL	1	1,600	1	1,600	4	54,526	4	54,526
IDAHO	1	1,600	1	1,600	2	33,966	2	33,966
UTAH	---	---	---	---	2	20,560	2	20,560

STATE	1942 INITIAL NUMBER	1942 INITIAL AMOUNT DOL.	1942 TOTAL NUMBER	1942 TOTAL AMOUNT DOL.	1943 INITIAL NUMBER	1943 INITIAL AMOUNT DOL.	1943 TOTAL NUMBER	1943 TOTAL AMOUNT DOL.
U.S. TOTAL	6	77,902	6	77,902	1	14,873	1	14,873
ARIZONA	1	35,000	1	35,000	---	---	---	---
CALIFORNIA	1	25,000	1	25,000	---	---	---	---
IDAHO	2	2,970	2	2,970	1	14,873	1	14,873
WASHINGTON	2	14,932	2	14,932	---	---	---	---

STATE	1945 INITIAL NUMBER	1945 INITIAL AMOUNT DOL.	1945 TOTAL NUMBER	1945 TOTAL AMOUNT DOL.	1946 INITIAL NUMBER	1946 INITIAL AMOUNT DOL.	1946 TOTAL NUMBER	1946 TOTAL AMOUNT DOL.
U.S. TOTAL	4	83,150	4	83,150	7	134,322	9	149,322
ARIZONA	---	---	---	---	---	---	1	3,000
CALIFORNIA	---	---	---	---	---	---	1	12,000
IDAHO	1	39,400	1	39,400	---	---	---	---
NEVADA	1	23,000	1	23,000	---	---	---	---
NEW MEXICO	---	---	---	---	1	22,000	1	22,000
OREGON	---	---	---	---	1	7,500	1	7,500
UTAH	2	20,750	2	20,750	2	48,242	2	48,242
WASHINGTON	---	---	---	---	2	6,580	2	6,580
WYOMING	---	---	---	---	1	50,000	1	50,000

STATE	1947 INITIAL NUMBER	1947 INITIAL AMOUNT DOL.	1947 TOTAL NUMBER	1947 TOTAL AMOUNT DOL.	1948 INITIAL NUMBER	1948 INITIAL AMOUNT DOL.	1948 TOTAL NUMBER	1948 TOTAL AMOUNT DOL.
U.S. TOTAL	7	117,880	8	119,880	8	154,835	12	159,635
ARIZONA	1	7,500	1	7,500	---	---	---	---
COLORADO	---	---	---	---	2	62,000	2	62,000
IDAHO	3	51,100	3	51,100	2	10,835	4	14,035
NEVADA	---	---	---	---	1	13,000	1	13,000
UTAH	1	50,000	2	52,000	2	53,000	2	53,000
WASHINGTON	2	9,280	2	9,280	1	16,000	3	17,600

1/ NO ACTIVITY IN FY 1944

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UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Exhibit A.6: -TOTAL WATER AND WASTE LOANS: LOANS OBLIGATED BY STATES. FISCAL YEARS 1940-1975

STATE	1949 INITIAL NUMBER	1949 INITIAL AMOUNT DOL.	1949 TOTAL NUMBER	1949 TOTAL AMOUNT DOL.	1950 INITIAL NUMBER	1950 INITIAL AMOUNT DOL.	1950 TOTAL NUMBER	1950 TOTAL AMOUNT DOL.
U.S. TOTAL	3	35,985	10	93,335	9	230,245	12	258,345
ARIZONA	---	---	---	---	1	25,000	2	34,500
IDAHO	2	20,500	3	22,000	2	57,000	3	67,600
NEW MEXICO	---	---	---	---	1	30,000	1	30,000
OREGON	---	---	1	4,500	---	---	---	---
UTAH	---	---	4	50,350	5	118,245	5	118,245
WASHINGTON	1	15,485	2	16,485	---	---	1	8,000

STATE	1951 INITIAL NUMBER	1951 INITIAL AMOUNT DOL.	1951 TOTAL NUMBER	1951 TOTAL AMOUNT DOL.	1952 INITIAL NUMBER	1952 INITIAL AMOUNT DOL.	1952 TOTAL NUMBER	1952 TOTAL AMOUNT DOL.
U.S. TOTAL	18	536,030	21	550,260	17	372,405	21	397,805
ARIZONA	1	35,000	1	35,000	1	60,000	1	60,000
COLORADO	1	100,000	2	105,000	2	14,000	2	14,000
IDAHO	5	107,100	6	114,100	---	---	1	2,600
KANSAS	1	27,000	1	27,000	---	---	---	---
NEVADA	1	12,000	1	12,000	1	18,400	1	18,400
UTAH	3	112,180	4	114,410	1	9,970	2	24,770
WASHINGTON	6	142,750	6	142,750	12	270,035	14	278,035

STATE	1953 INITIAL NUMBER	1953 INITIAL AMOUNT DOL.	1953 TOTAL NUMBER	1953 TOTAL AMOUNT DOL.	1954 INITIAL NUMBER	1954 INITIAL AMOUNT DOL.	1954 TOTAL NUMBER	1954 TOTAL AMOUNT DOL.
U.S. TOTAL	26	817,865	29	839,815	16	835,300	21	875,850
CALIFORNIA	1	22,500	1	22,500	---	---	1	12,800
COLORADO	2	48,600	2	48,600	1	12,000	1	12,000
IDAHO	---	---	1	7,000	1	50,000	1	50,000
MONTANA	---	---	---	---	1	95,000	1	95,000
NEVADA	1	100,000	1	100,000	---	---	---	---
NEW MEXICO	1	50,000	1	50,000	1	70,000	1	70,000
OREGON	3	99,470	3	99,470	2	125,000	2	125,000
UTAH	3	116,500	4	118,450	1	50,000	3	66,000
WASHINGTON	15	380,795	16	393,795	9	433,300	11	445,050

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UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Exhibit A.6: -TOTAL WATER AND WASTE LOANS: LOANS OBLIGATED BY STATES, FISCAL YEARS 1940-1975

STATE	1955 INITIAL NUMBER	1955 INITIAL AMOUNT DOL.	1955 TOTAL NUMBER	1955 TOTAL AMOUNT DOL.	1956 INITIAL NUMBER	1956 INITIAL AMOUNT DOL.	1956 TOTAL NUMBER	1956 TOTAL AMOUNT DOL.
U.S. TOTAL	20	1,108,560	30	1,186,860	10	904,880	14	972,030
ARIZONA	1	10,000	1	10,000	---	---	---	---
CALIFORNIA	---	---	---	---	---	---	1	52,000
COLORADO	2	54,500	2	54,500	1	11,000	1	11,000
IDAHO	---	---	1	1,800	1	8,615	1	8,615
KANSAS	1	9,750	1	9,750	---	---	---	---
KENTUCKY	---	---	---	---	2	492,100	2	492,100
MONTANA	2	358,000	4	370,000	1	225,000	1	225,000
NEW MEXICO	---	---	1	3,000	---	---	---	---
OREGON	2	65,750	2	65,750	---	---	1	3,000
UTAH	1	250,000	2	260,000	---	---	---	---
WASHINGTON	11	360,560	16	412,060	4	144,211	6	156,361
WYOMING	---	---	---	---	1	23,954	1	23,954

STATE	1957 INITIAL NUMBER	1957 INITIAL AMOUNT DOL.	1957 TOTAL NUMBER	1957 TOTAL AMOUNT DOL.	1958 INITIAL NUMBER	1958 INITIAL AMOUNT DOL.	1958 TOTAL NUMBER	1958 TOTAL AMOUNT DOL.
U.S. TOTAL	9	695,250	12	707,050	14	944,500	21	997,600
COLORADO	2	54,500	2	54,500	3	99,400	4	111,900
KANSAS	2	349,000	2	349,000	3	453,400	3	453,400
MONTANA	---	---	1	5,300	---	---	---	---
NEVADA	---	---	---	---	---	---	1	5,100
OREGON	---	---	---	---	1	246,000	1	246,000
TEXAS	---	---	---	---	1	27,500	1	27,500
WASHINGTON	4	259,850	6	260,350	5	95,830	10	131,330
WYOMING	1	31,900	1	31,900	1	22,370	1	22,370

STATE	1959 INITIAL NUMBER	1959 INITIAL AMOUNT DOL.	1959 TOTAL NUMBER	1959 TOTAL AMOUNT DOL.	1960 INITIAL NUMBER	1960 INITIAL AMOUNT DOL.	1960 TOTAL NUMBER	1960 TOTAL AMOUNT DOL.
U.S. TOTAL	29	2,727,900	37	2,917,060	11	646,400	15	709,900
COLORADO	5	245,500	6	284,500	3	471,250	3	471,250
KANSAS	5	457,200	5	457,200	2	18,860	2	18,860
KENTUCKY	3	750,000	3	750,000	---	---	---	---
MONTANA	---	---	---	---	---	---	1	15,000
NEVADA	2	233,000	2	233,000	---	---	1	30,000
OREGON	2	52,800	3	54,300	2	19,690	2	19,690
TEXAS	10	838,800	11	846,300	1	88,100	2	104,100
UTAH	---	---	1	89,860	---	---	---	---
WASHINGTON	1	5,700	5	57,000	3	48,500	4	51,000
W.VIRGINIA	1	144,900	1	144,900	---	---	---	---

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UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Exhibit A.6:--TOTAL WATER AND WASTE LOANS: LOANS OBLIGATED BY STATES, FISCAL YEARS 1940-1975

STATE	1961				1962			
	INITIAL		TOTAL		INITIAL		TOTAL	
	NUMBER	AMOUNT DOL.	NUMBER	AMOUNT DOL.	NUMBER	AMOUNT DOL.	NUMBER	AMOUNT DOL.
U.S. TOTAL	27	1,836,100	33	1,945,600	69	9,940,500	81	10,171,000
ALABAMA	---	---	---	---	1	114,000	1	114,000
ARIZONA	1	42,660	2	53,460	---	---	---	---
CALIFORNIA	1	65,000	1	65,000	1	37,000	1	37,000
COLORADO	4	663,000	6	731,700	13	2,689,010	16	2,814,010
INDIANA	---	---	---	---	4	1,232,500	4	1,232,500
KANSAS	10	446,440	10	446,440	11	1,332,250	13	1,336,250
KENTUCKY	---	---	---	---	1	255,000	1	255,000
MISSOURI	---	---	---	---	1	90,000	1	90,000
MONTANA	---	---	---	---	1	90,000	1	90,000
NEVADA	---	---	2	27,500	---	---	1	45,000
NEW MEXICO	---	---	---	---	1	16,000	1	16,000
N.C.	---	---	---	---	2	632,200	2	632,200
N. DAKOTA	---	---	---	---	1	110,000	1	110,000
OREGON	---	---	---	---	2	134,600	2	134,600
S. DAKOTA	---	---	---	---	1	490,500	1	490,500
TENNESSEE	1	90,000	1	90,000	3	418,000	3	418,000
TEXAS	6	413,800	7	416,300	18	1,699,400	20	1,720,000
UTAH	---	---	---	---	1	14,000	3	22,400
WASHINGTON	3	101,700	3	101,700	4	105,700	6	133,200
W.VIRGINIA	---	---	---	---	3	480,340	3	480,340
WYOMING	1	13,500	1	13,500	---	---	---	---

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UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Exhibit A.6:--TOTAL WATER AND WASTE LOANS: LOANS OBLIGATED BY STATES. FISCAL YEARS 1940-1975

STATE	1963 INITIAL NUMBER	1963 INITIAL AMOUNT DOL.	1963 TOTAL NUMBER	1963 TOTAL AMOUNT DOL.	1964 INITIAL NUMBER	1964 INITIAL AMOUNT DOL.	1964 TOTAL NUMBER	1964 TOTAL AMOUNT DOL.
U.S. TOTAL	114	13,876,565	135	14,740,695	239	32,876,590	271	34,006,810
ALABAMA	2	429,100	2	429,100	8	2,132,000	8	2,132,000
ARIZONA	1	22,500	1	22,500	---	---	---	---
ARKANSAS	4	320,500	4	320,500	7	453,300	7	453,300
CALIFORNIA	1	32,000	1	32,000	2	91,000	3	98,000
COLORADO	8	2,914,500	14	3,295,300	3	866,000	8	1,203,200
FLORIDA	1	50,000	1	50,000	12	2,037,650	13	2,055,650
GEORGIA	1	95,000	1	95,000	12	752,100	12	752,100
IDAHO	1	90,000	1	90,000	2	37,800	2	37,800
ILLINOIS	1	34,500	1	34,500	2	255,000	2	255,000
INDIANA	5	1,032,665	7	1,231,665	8	3,077,300	12	3,199,980
IOWA	---	---	---	---	1	2,000	1	2,000
KANSAS	13	1,137,840	19	1,179,070	16	2,084,430	17	2,093,430
KENTUCKY	3	541,500	3	541,500	1	350,000	1	350,000
LOUISIANA	---	---	---	---	3	306,080	3	306,080
MAINE	---	---	---	---	1	86,500	1	86,500
MISS.	10	520,000	10	520,000	22	1,911,100	25	1,939,090
MISSOURI	7	767,500	7	767,500	12	1,709,000	12	1,709,000
MONTANA	2	75,000	2	75,000	---	---	---	---
NEW JERSEY	---	---	---	---	1	60,000	1	60,000
NEW MEXICO	4	328,400	5	508,400	4	264,750	4	264,750
N.C.	1	569,000	1	569,000	5	1,737,000	5	1,737,000
OHIO	1	321,000	1	321,000	---	---	1	192,000
OKLAHOMA	---	---	---	---	11	968,560	11	968,560
OREGON	1	22,000	1	22,000	1	76,000	2	88,000
PENN.	1	50,000	1	50,000	2	167,000	2	167,000
S.C.	1	375,000	1	375,000	3	740,000	3	740,000
S. DAKOTA	2	41,500	2	41,500	---	---	1	86,000
TENNESSEE	2	360,000	2	360,000	15	3,337,500	16	3,364,500
TEXAS	31	3,189,560	32	3,217,060	69	7,352,320	77	7,615,620
UTAH	1	25,000	1	25,000	---	---	---	---
WASHINGTON	4	70,000	9	105,600	6	691,500	8	702,050
W.VIRGINIA	4	403,000	4	403,000	7	1,165,200	10	1,182,700
WISCONSIN	---	---	---	---	1	100,000	1	100,000
WYOMING	1	59,500	1	59,500	2	65,500	2	65,500

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UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Exhibit A.6:--TOTAL WATER AND WASTE LOANS: LCANS OBLIGATEC BY STATES, FISCAL YEARS 1940-1975

STATE	1965 INITIAL NUMBER	1965 INITIAL AMOUNT DOL.	1965 TOTAL NUMBER	1965 TOTAL AMOUNT DOL.	1966 INITIAL NUMBER	1966 INITIAL AMOUNT DOL.	1966 TOTAL NUMBER	1966 TOTAL AMOUNT DOL.
U.S. TOTAL	324	47.982.510	394	50.389.480	705	107.889.768	801	112.802.788
ALABAMA	9	1.314.500	11	1.337.500	26	3.434.250	30	3.521.750
ARIZONA	2	24.350	2	24.350	3	398.190	3	398.190
ARKANSAS	12	1.115.000	13	1.120.500	34	2.142.180	35	2.177.180
CALIFORNIA	2	192.500	2	192.500	4	268.640	4	268.640
COLORADO	3	109.000	8	381.350	4	1.464.380	9	1.849.440
FLORIDA	10	2.629.520	14	2.685.020	7	1.065.810	10	1.256.140
GEORGIA	5	211.200	5	211.200	30	2.554.190	32	2.575.160
IDAHO	1	15.250	1	15.250	4	146.500	5	152.500
ILLINOIS	6	836.000	7	846.000	26	3.641.600	28	3.695.600
INDIANA	4	1.024.000	5	1.096.000	13	5.248.430	14	5.365.930
IOWA	---	---	1	21.750	29	2.792.653	30	2.808.653
KANSAS	17	2.140.320	22	2.193.250	23	2.847.120	31	2.988.290
KENTUCKY	3	2.035.000	4	2.157.000	7	3.278.000	10	3.782.000
LOUISIANA	8	571.470	8	571.470	13	1.720.150	13	1.720.150
MAINE	---	---	---	---	1	130.130	1	130.130
MICHIGAN	---	---	---	---	2	336.360	2	336.360
MINNESOTA	---	---	---	---	5	342.220	5	342.220
MISS.	46	6.394.000	59	6.898.000	74	9.391.970	91	10.365.030
MISSOURI	26	3.215.000	28	3.340.000	49	10.577.000	54	11.176.000
MONTANA	---	---	---	---	5	250.500	5	250.500
NEBRASKA	---	---	---	---	1	68.000	1	68.000
NEVADA	---	---	1	7.000	3	273.000	3	273.000
NEW JERSEY	---	---	---	---	2	641.100	2	641.100
NEW MEXICO	4	285.000	5	405.000	6	1.078.060	7	1.105.060
NEW YORK	---	---	---	---	6	1.028.980	6	1.028.980
N.C.	12	3.693.520	13	3.723.520	22	3.745.760	28	4.122.640
N. DAKOTA	3	121.850	3	121.850	9	828.830	9	828.830
OKLAHOMA	20	4.811.470	27	4.847.570	38	5.784.850	41	6.195.820
OREGON	4	216.880	4	216.880	13	2.137.200	14	2.155.200
PENN.	1	42.000	1	42.000	16	3.989.760	17	3.999.760
S.C.	2	281.000	3	292.000	11	2.555.300	11	2.555.300
S. DAKOTA	2	389.000	2	389.000	6	581.850	6	581.850
TENNESSEE	21	5.149.810	24	5.242.230	23	4.933.500	26	5.158.430
TEXAS	83	9.179.410	101	9.902.730	150	21.521.315	172	22.095.365
UTAH	---	---	4	101.000	1	425.000	2	468.000
VERMONT	---	---	---	---	2	777.300	2	777.300
VIRGINIA	1	150.000	1	150.000	4	607.320	4	607.320
WASHINGTON	1	83.000	5	105.100	10	1.255.550	13	1.287.150
W.VIRGINIA	5	1.151.460	5	1.151.460	14	2.571.220	15	2.598.220
WISCONSIN	2	385.000	2	385.000	7	936.000	8	976.000
WYOMING	3	216.000	3	216.000	1	117.400	1	117.400
P. RICO	---	---	---	---	1	2.200	1	2.200

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UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

xhibit A.6:--TOTAL WATER AND WASTE LOANS: LOANS OBLIGATED BY STATES, FISCAL YEARS 1940-1975

STATE	1967				1968			
	INITIAL		TOTAL		INITIAL		TOTAL	
	NUMBER	AMOUNT DOL.	NUMBER	AMOUNT DOL.	NUMBER	AMOUNT DOL.	NUMBER	AMOUNT DOL.
U.S. TOTAL	915	165,206,014	1,089	175,173,179	775	149,802,640	1,016	162,592,350
ALABAMA	21	4,483,200	24	4,532,700	21	2,512,690	26	2,735,910
ALASKA	1	408,600	1	408,600	1	250,000	1	250,000
ARIZONA	2	29,500	4	227,500	4	595,280	4	595,280
ARKANSAS	34	5,217,630	39	5,484,980	33	5,618,520	42	6,106,920
CALIFORNIA	13	1,883,560	13	1,883,560	9	1,779,300	14	1,915,710
COLORADO	15	1,434,560	23	1,832,060	12	816,050	22	1,286,080
FLORIDA	17	3,449,070	24	3,588,270	15	2,598,200	27	3,046,780
GEORGIA	23	2,740,440	26	2,795,040	28	5,843,530	31	6,306,030
IDAHO	15	1,251,280	16	1,263,280	21	2,863,800	25	3,002,910
ILLINOIS	30	7,565,000	32	7,995,000	10	2,121,000	14	2,228,900
INDIANA	30	10,572,720	33	11,174,385	13	3,516,400	17	3,779,300
IOWA	33	3,933,300	36	4,074,100	16	1,808,600	26	2,120,660
KANSAS	21	3,845,110	27	4,017,260	14	1,600,950	25	1,847,160
KENTUCKY	19	8,140,500	19	8,140,500	11	4,406,500	12	4,428,400
LOUISIANA	26	2,614,000	29	2,730,000	31	4,281,220	31	4,281,220
MAINE	1	16,400	1	16,400	0	853,350	9	865,850
MARYLAND	7	1,166,330	7	1,166,330	4	764,000	5	916,000
MICHIGAN	7	2,224,000	7	2,224,000	4	1,838,000	6	1,934,000
MINNESOTA	8	972,794	8	972,794	13	1,724,020	15	1,743,780
MISS.	126	13,989,560	158	15,586,100	131	20,662,700	174	22,481,800
MISSOURI	50	12,669,400	62	14,224,400	11	2,172,000	23	2,800,400
MONTANA	11	749,050	12	749,050	7	615,200	7	615,200
NEBRASKA	6	316,570	6	316,570	7	386,330	7	386,330
NEVADA	4	623,970	6	648,270	---	---	3	34,000
N.H.	2	90,000	2	90,000	1	60,000	1	60,000
NEW JERSEY	8	3,903,050	8	3,903,050	3	1,885,000	4	2,185,000
NEW MEXICO	12	1,283,450	19	1,572,050	15	1,072,620	15	1,072,620
NEW YORK	6	1,708,650	6	1,708,650	9	2,111,870	12	2,934,110
N.C.	21	9,395,700	27	9,775,010	24	3,626,040	26	4,579,540
N. DAKOTA	15	1,018,670	18	1,046,780	6	500,080	17	810,260
OHIO	8	3,258,010	8	3,258,010	14	16,941,900	15	17,044,600
OKLAHOMA	73	9,429,470	76	9,914,470	47	12,161,760	54	12,501,260
OREGON	14	1,972,100	20	2,759,900	12	1,421,300	16	1,653,800
PENN.	18	6,666,360	22	7,128,360	11	3,382,650	17	3,791,100
S.C.	11	1,088,250	13	1,144,750	16	3,865,630	19	4,264,130
S. DAKOTA	7	441,690	7	441,690	5	1,017,140	5	1,017,140
TENNESSEE	24	6,674,520	29	7,054,590	7	2,714,500	13	2,911,400
TEXAS	105	16,113,460	141	17,568,570	97	18,045,660	134	20,486,940
UTAH	6	712,000	7	724,720	8	682,900	9	687,700
VERMONT	2	132,750	3	147,750	3	331,250	3	331,250
VIRGINIA	11	3,328,060	13	3,391,060	10	3,564,170	13	3,665,330
WASHINGTON	17	2,347,550	19	2,428,550	10	1,017,920	16	1,250,550
W.VIRGINIA	17	3,655,180	20	3,774,970	19	2,704,850	24	2,910,250
WISCONSIN	12	1,465,000	12	1,465,000	12	1,516,000	15	1,608,000
WYOMING	3	164,000	3	164,000	7	740,260	9	828,690
P. RICO	1	11,500	1	11,500	13	611,100	13	611,100

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UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Exhibit A.6: --TOTAL WATER AND WASTE LOANS: LOANS OBLIGATED BY STATES, FISCAL YEARS 1940-1975

STATE	1969 INITIAL NUMBER	1969 INITIAL AMOUNT DOL.	1969 TOTAL NUMBER	1969 TOTAL AMOUNT DOL.	1970 INITIAL NUMBER	1970 INITIAL AMOUNT DOL.	1970 TOTAL NUMBER	1970 TOTAL AMOUNT DOL.
U.S. TOTAL	739	147,036,310	981	164,447,160	647	123,183,450	941	146,030,490
ALABAMA	34	6,031,190	35	6,056,190	28	4,677,000	41	5,539,400
ALASKA	1	370,000	1	370,000	1	522,600	1	522,600
ARIZONA	5	794,700	8	1,361,100	4	610,900	6	680,900
ARKANSAS	31	4,736,090	42	5,281,090	28	3,975,200	36	4,208,200
CALIFORNIA	21	3,059,370	23	3,146,500	11	1,897,950	14	1,932,720
COLORADO	22	3,190,650	32	4,091,060	6	820,200	11	1,273,000
CONN.	---	---	---	---	1	393,000	1	393,000
DELAWARE	1	407,200	1	407,200	---	---	1	92,800
FLORIDA	12	2,811,000	29	4,049,020	7	3,287,600	23	4,936,100
GEORGIA	14	2,325,400	17	2,342,830	10	1,528,000	15	1,890,000
IDAHO	16	4,080,000	21	4,281,260	16	1,564,300	21	1,740,100
ILLINOIS	22	3,847,000	28	4,794,000	14	2,328,000	16	2,346,000
INDIANA	16	4,829,900	22	5,542,450	17	4,957,000	24	6,065,500
IOWA	21	2,435,800	36	2,933,600	14	1,906,500	32	2,805,900
KANSAS	10	2,359,980	20	3,074,870	10	1,378,200	11	1,400,000
KENTUCKY	29	8,789,850	29	8,789,850	16	6,033,700	18	6,384,300
LOUISIANA	30	5,373,900	31	5,453,900	36	6,542,000	43	7,149,000
MAINE	5	658,130	7	719,430	3	370,000	4	398,500
MARYLAND	7	1,158,630	11	1,447,650	7	1,249,400	7	1,249,400
MASS.	1	602,200	1	602,200	---	---	1	220,000
MICHIGAN	7	2,801,000	7	2,801,000	7	1,968,000	8	2,068,000
MINNESOTA	12	1,703,550	12	1,703,550	7	907,000	10	1,004,000
MISS.	43	7,484,720	73	9,476,300	60	9,825,200	106	11,801,000
MISSOURI	23	4,378,150	34	4,785,750	8	1,588,000	13	2,133,000
MONTANA	5	304,000	5	304,000	6	557,500	8	591,270
NEBRASKA	5	662,040	5	662,040	7	1,464,400	7	1,464,400
NEVADA	3	361,000	3	361,000	1	308,000	2	403,200
N.H.	1	560,000	1	560,000	3	1,975,000	3	1,975,000
NEW JERSEY	3	1,251,460	5	1,781,460	3	1,261,000	4	1,276,000
NEW MEXICO	12	1,448,250	16	1,554,350	12	953,000	14	1,003,000
NEW YORK	7	3,418,000	9	3,463,000	11	2,276,000	13	2,367,000
N.C.	18	4,623,800	27	4,890,550	33	6,250,900	44	6,655,100
N. DAKOTA	12	1,324,170	19	1,488,540	11	3,648,300	15	3,775,500
OHIO	15	5,932,000	16	6,581,000	12	4,711,000	16	4,840,500
OKLAHOMA	51	8,333,950	66	9,807,720	37	6,631,200	61	10,093,600
OREGON	11	2,431,700	14	2,469,700	4	349,000	15	1,064,000
PENN.	13	4,441,000	19	4,737,000	19	4,090,000	28	5,201,000
S.C.	29	5,086,030	32	5,187,830	13	4,484,600	19	5,405,000
S. DAKOTA	12	808,910	14	845,410	7	560,600	9	700,600
TENNESSEE	19	7,116,000	31	7,585,640	20	4,509,000	22	4,536,000
TEXAS	52	10,532,080	80	12,910,440	65	10,467,600	96	13,530,600
UTAH	11	1,255,680	11	1,255,680	4	588,500	10	1,038,300
VERMONT	3	163,400	3	163,400	1	160,000	3	225,000
VIRGINIA	16	4,142,530	16	4,142,530	12	1,408,700	17	2,873,200
WASHINGTON	14	1,991,300	19	2,208,600	14	1,722,200	25	2,194,100
W.VIRGINIA	16	3,225,350	18	4,605,970	16	3,214,200	18	3,241,200
WISCONSIN	11	2,539,000	13	2,639,000	9	1,400,000	9	1,400,000
WYOMING	2	165,700	2	165,700	5	527,000	6	560,000
P. RICO	15	646,600	17	760,600	11	1,333,000	14	1,353,500

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UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Exhibit A.6:--TOTAL WATER AND WASTE LOANS: LOANS OBLIGATED BY STATES, FISCAL YEARS 1940-1975

STATE	1971 INITIAL NUMBER	1971 INITIAL AMOUNT DOL.	1971 TOTAL NUMBER	1971 TOTAL AMOUNT DOL.	1972 INITIAL NUMBER	1972 INITIAL AMOUNT DOL.	1972 TOTAL NUMBER	1972 TOTAL AMOUNT DOL.
U.S. TOTAL	899	213.092.800	1.367	261.703.900	631	220.777.500	1.226	299.999.000
ALABAMA	33	6.775.100	57	8.936.300	19	4.447.700	36	6.351.800
ALASKA	1	315.000	1	315.000	4	1.410.200	5	1.445.200
ARIZONA	8	1.298.400	9	1.356.400	2	1.224.600	6	1.432.600
ARKANSAS	35	6.425.400	50	7.178.700	25	8.839.900	47	11.906.400
CALIFORNIA	18	2.576.000	23	2.922.700	17	5.761.000	23	6.177.000
COLORADO	14	2.478.600	22	2.761.600	6	615.000	22	2.253.900
CONN.	---	---	---	---	1	7.000	1	7.000
DELAWARE	1	190.000	2	209.000	---	---	---	---
FLORIDA	14	4.999.000	28	6.470.100	11	7.666.000	27	10.222.500
GEORGIA	23	4.007.000	27	4.396.000	16	5.235.000	33	6.671.500
IDAHO	13	3.854.200	16	3.991.100	7	2.753.400	11	2.852.200
ILLINOIS	20	4.746.000	27	5.025.000	28	10.152.100	36	10.632.600
INDIANA	20	8.187.500	25	9.948.500	14	6.946.900	30	9.973.800
IOWA	53	9.911.200	66	11.787.200	20	11.972.000	38	17.467.000
KANSAS	23	4.341.600	46	6.150.500	14	5.949.800	33	7.377.200
KENTUCKY	16	3.441.500	23	5.496.800	8	1.749.800	14	2.249.900
LOUISIANA	29	6.099.200	34	6.210.800	33	6.033.500	48	6.952.600
MAINE	7	2.143.000	11	3.436.000	8	2.430.500	14	3.590.500
MARYLAND	8	2.290.300	17	3.122.200	---	---	3	599.300
MASS.	1	136.000	2	143.000	3	970.000	3	970.000
MICHIGAN	15	3.857.000	17	4.017.000	18	8.614.000	29	10.346.000
MINNESOTA	20	4.661.000	21	4.685.000	21	3.671.000	26	3.907.000
MISS.	51	13.098.100	112	16.467.000	41	11.114.400	109	17.412.300
MISSOURI	32	5.642.700	51	7.774.100	21	5.102.300	45	7.774.200
MONTANA	3	440.000	5	462.800	6	512.600	9	652.700
NEBRASKA	7	1.681.000	7	1.681.000	9	2.722.000	10	2.804.300
NEVADA	1	56.600	5	412.400	2	1.122.000	2	1.122.000
N.H.	2	2.255.000	4	3.305.000	4	611.000	5	621.000
NEW JERSEY	6	2.411.200	12	2.892.700	---	---	1	571.400
NEW MEXICO	5	766.000	13	920.300	9	641.000	11	817.000
NEW YORK	22	7.616.000	32	11.172.400	23	13.236.000	33	17.474.000
N.C.	40	7.427.200	53	8.624.200	22	5.186.500	51	5.531.000
N. DAKOTA	18	2.068.000	23	2.180.800	10	3.035.700	15	5.900.700
OHIO	16	15.049.500	20	15.851.500	16	15.915.000	29	19.245.000
OKLAHOMA	37	6.980.600	85	11.711.000	12	3.221.400	52	7.665.000
OREGON	10	1.804.000	14	1.962.600	7	761.000	16	1.306.500
PENN.	18	5.979.500	22	6.462.000	17	10.964.000	33	11.889.000
R.I.	1	35.000	1	35.000	1	445.000	1	445.000
S.C.	18	10.177.100	25	11.321.100	21	10.077.900	38	12.847.500
S. DAKOTA	10	1.315.000	15	1.495.900	7	1.128.600	9	1.303.600
TENNESSEE	33	6.733.600	59	9.328.000	31	7.748.000	64	10.871.000
TEXAS	62	15.535.700	115	21.366.000	30	9.470.100	96	17.241.300
UTAH	9	1.313.500	12	1.795.200	8	1.694.700	14	1.918.700
VERMONT	5	711.000	5	711.000	5	2.098.500	7	2.492.500
VIRGINIA	35	6.722.300	44	8.143.100	7	2.963.100	21	8.129.900
WASHINGTON	20	3.081.500	31	4.501.200	11	2.116.600	18	2.704.700
W.VIRGINIA	22	4.638.500	28	5.538.500	13	3.688.400	22	4.636.400
WISCONSIN	29	5.677.700	31	5.833.700	13	6.666.000	17	6.920.000
WYOMING	6	518.500	10	565.500	5	1.011.300	5	1.011.300
P. RICO	9	633.000	9	633.000	4	269.000	7	503.000
VIRGIN IS.	---	---	---	---	1	802.000	1	802.000

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UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Exhibit A.6: --TOTAL WATER AND WASTE LOANS: LOANS OBLIGATED BY STATES. FISCAL YEARS 1940-1975

STATE	1973 INITIAL NUMBER	1973 INITIAL AMOUNT DOL.	1973 TOTAL NUMBER	1973 TOTAL AMOUNT DOL.	1974 INITIAL NUMBER	1974 INITIAL AMOUNT DOL.	1974 TOTAL NUMBER	1974 TOTAL AMOUNT DOL.
U.S. TOTAL	768	300.182.500	1.502	399.994.800	546	288.354.157	1.325	469.999.100
ALABAMA	28	7.848.000	54	10.636.800	20	6.708.600	58	11.914.200
ALASKA	3	1.900.000	7	2.959.500	---	---	5	1.895.000
ARIZONA	6	1.445.000	9	1.915.100	5	2.903.500	9	3.078.500
ARKANSAS	33	8.554.200	72	13.703.800	17	5.601.200	55	9.777.300
CALIFORNIA	16	4.797.000	35	6.942.000	13	12.820.457	23	13.666.000
COLORADO	8	3.045.900	20	4.577.300	12	2.845.800	29	6.265.300
CONN.	---	---	---	---	2	970.000	2	970.000
FLORIDA	23	39.365.400	36	41.388.800	8	8.469.500	33	24.904.800
GEORGIA	26	9.944.000	39	11.583.000	14	5.285.000	28	8.519.000
IDAHO	15	3.392.000	24	4.089.300	14	2.584.400	20	2.958.600
ILLINOIS	26	11.650.500	60	17.388.200	18	9.151.000	36	12.878.500
INDIANA	23	14.723.400	36	16.322.600	18	10.182.000	32	13.837.500
IOWA	40	8.012.900	78	10.949.400	12	8.462.600	41	17.682.600
KANSAS	11	3.905.900	35	6.026.600	5	3.921.300	30	7.896.200
KENTUCKY	10	5.897.000	15	6.522.000	19	8.893.100	30	12.624.100
LOUISIANA	31	6.185.700	51	7.663.900	22	3.978.100	36	5.118.200
MAINE	8	4.304.000	14	7.696.000	16	8.919.000	21	9.346.500
MARYLAND	3	849.000	3	849.000	5	2.213.000	8	2.419.000
MASS.	10	3.847.000	12	4.473.000	4	1.058.900	7	1.158.900
MICHIGAN	5	3.800.000	13	7.287.000	16	8.688.000	28	38.196.000
MINNESOTA	11	4.386.000	21	5.369.000	10	5.089.000	15	5.479.000
MISS.	48	11.816.100	143	20.393.500	30	8.128.900	139	21.779.600
MISSOURI	23	7.543.500	54	11.315.300	15	4.023.600	53	8.117.000
MONTANA	6	461.000	8	622.600	3	2.435.500	5	2.480.500
NEBRASKA	3	2.365.000	8	2.689.500	1	2.200.000	8	3.261.000
NEVADA	5	783.000	10	1.382.000	---	---	1	926.000
N.H.	6	5.275.000	7	6.458.000	---	---	---	---
NEW JERSEY	6	5.103.200	8	5.486.800	9	7.706.500	11	8.884.000
NEW MEXICO	9	833.000	14	1.252.000	8	524.000	12	764.600
NEW YORK	27	15.562.000	46	20.122.000	15	9.552.100	29	14.376.100
N.C.	29	13.580.500	55	16.650.900	20	19.251.000	37	25.252.600
N. DAKOTA	13	3.017.000	23	4.080.700	11	7.504.000	22	10.685.000
OHIO	5	3.225.000	13	6.768.600	8	11.377.000	23	17.637.000
OKLAHOMA	29	6.686.500	55	8.273.500	20	8.170.000	46	11.599.600
OREGON	12	4.253.200	22	5.492.500	12	2.946.300	26	6.227.500
PENN.	24	19.152.800	37	20.774.300	24	17.864.300	40	19.846.300
R.I.	1	1.015.000	1	1.015.000	1	7.000.000	1	7.000.000
S.C.	18	9.589.800	30	12.074.400	10	11.513.000	36	18.803.500
S. DAKOTA	6	8.076.300	11	8.446.200	5	3.603.000	9	3.890.000
TENNESSEE	21	5.388.000	64	13.841.000	23	12.828.000	63	19.767.000
TEXAS	16	4.522.500	72	12.797.300	22	11.210.600	99	25.936.500
UTAH	17	1.906.800	26	2.336.000	5	953.000	14	1.393.300
VERMONT	2	150.000	2	150.000	7	1.305.000	10	2.480.000
VIRGINIA	12	4.729.000	28	7.403.800	9	5.858.000	25	8.757.300
WASHINGTON	7	946.400	16	1.339.000	14	2.208.900	19	2.580.200
W.VIRGINIA	14	4.275.000	31	8.150.600	15	8.069.000	31	11.491.000
WISCONSIN	63	10.330.000	65	10.397.000	6	2.864.000	14	3.971.300
WYOMING	3	680.000	4	690.000	3	450.000	4	482.000
P. RICO	7	1.064.000	15	1.648.000	---	---	1	75.000
VIRGIN IS.	---	---	---	---	---	---	1	950.000

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UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Exhibit A.6:—TOTAL WATER AND WASTE LOANS: LOANS OBLIGATED BY STATES, FISCAL YEARS 1940-1975

STATE	1975 INITIAL NUMBER	1975 INITIAL AMOUNT DOL.	1975 TOTAL NUMBER	1975 TOTAL AMOUNT DOL.	1976 INITIAL NUMBER	1976 INITIAL AMOUNT DOL.	1976 TOTAL NUMBER	1976 TOTAL AMOUNT DOL.
U.S. TOTAL	658	320,188,646	1,451	469,986,946				
ALABAMA	25	8,532,000	64	16,843,000				
ALASKA	---	---	3	1,330,000				
ARIZONA	9	5,847,000	14	6,165,200				
ARKANSAS	20	6,731,000	50	10,373,600				
CALIFORNIA	34	14,769,546	45	17,104,546				
COLORADO	8	2,615,000	15	2,986,900				
CONN.	4	1,607,100	4	1,607,100				
DELAWARE	1	1,700,000	1	1,700,000				
FLORIDA	13	17,173,200	27	20,240,400				
GEORGIA	17	13,559,000	31	15,754,000				
IDAHO	13	1,729,300	19	2,553,200				
ILLINOIS	30	9,607,000	45	12,677,000				
INDIANA	12	7,918,000	30	14,658,300				
IOWA	17	5,280,800	29	10,142,100				
KANSAS	8	5,513,400	30	9,912,000				
KENTUCKY	18	8,191,000	35	13,260,000				
LOUISIANA	30	10,087,400	59	12,092,500				
MAINE	15	6,065,000	26	9,132,200				
MARYLAND	5	1,161,300	11	4,091,000				
MASS.	10	5,151,000	14	6,445,000				
MICHIGAN	11	12,335,000	16	13,888,000				
MINNESOTA	21	6,811,500	27	7,560,500				
MISS.	16	7,619,300	117	18,760,400				
MISSOURI	3	859,000	28	3,661,200				
MONTANA	8	3,159,000	11	3,202,000				
NEBRASKA	5	755,000	11	2,265,000				
NEVADA	7	2,039,700	9	2,103,700				
N.H.	5	1,491,000	6	1,495,000				
NEW JERSEY	4	4,440,000	5	4,790,000				
NEW MEXICO	18	2,338,700	28	3,756,700				
NEW YORK	28	18,045,400	38	21,037,000				
N.C.	26	22,308,000	51	27,698,000				
N. DAKOTA	5	3,187,000	16	5,333,000				
OHIO	13	7,966,000	34	14,225,000				
OKLAHOMA	18	4,793,800	53	7,852,400				
OREGON	13	3,608,000	25	4,796,500				
PENN.	28	27,898,400	48	31,276,500				
R.I.	---	---	1	85,000				
S.C.	13	8,215,000	41	12,834,000				
S. DAKOTA	16	3,130,000	21	4,031,200				
TENNESSEE	24	7,434,000	69	20,113,000				
TEXAS	20	8,853,500	89	21,448,100				
UTAH	11	3,017,800	18	3,888,400				
VERMONT	6	1,811,000	9	3,099,000				
VIRGINIA	7	8,499,300	25	13,503,400				
WASHINGTON	17	4,710,400	29	6,528,700				
W.VIRGINIA	13	5,926,500	29	11,269,400				
WISCONSIN	7	5,013,000	32	9,057,000				
WYOMING	1	166,000	2	199,000				
P. RICO	5	515,300	11	1,155,600				

UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Exhibit A.7:--TOTAL WATER AND WASTE DEVELOPMENT GRANTS: GRANTS OBLIGATED BY STATES, FISCAL YEARS 1966-1975

STATE	1966				1967			
	INITIAL		TOTAL		INITIAL		TOTAL	
	NUMBER	AMOUNT DOL.	NUMBER	AMOUNT DOL.	NUMBER	AMOUNT DOL.	NUMBER	AMOUNT DOL.
U.S. TOTAL	221	18,668,040	221	18,668,040	308	22,010,379	325	22,508,549
ALABAMA	8	292,080	8	292,080	11	1,077,100	11	1,077,100
ALASKA	---	---	---	---	1	197,200	1	197,200
ARIZONA	---	---	---	---	2	76,480	2	76,480
ARKANSAS	30	1,437,710	30	1,437,710	14	650,890	14	650,890
CALIFORNIA	2	91,390	2	91,390	8	320,070	8	320,070
COLORADO	2	145,320	2	145,320	10	620,595	11	651,785
FLORIDA	---	---	---	---	10	798,710	10	798,710
GEORGIA	22	890,915	22	890,915	19	911,190	20	918,990
IDAHO	1	25,500	1	25,500	6	330,990	7	338,090
ILLINOIS	6	544,000	6	544,000	8	776,390	9	780,390
INDIANA	2	378,150	2	378,150	7	495,420	7	495,420
IOWA	25	642,700	25	642,700	19	629,830	24	740,330
KANSAS	2	77,000	2	77,000	7	630,670	7	630,670
KENTUCKY	1	25,000	1	25,000	2	725,400	2	729,400
LOUISIANA	---	---	---	---	1	20,000	1	20,000
MAINE	1	127,630	1	127,630	1	16,400	1	16,400
MARYLAND	---	---	---	---	4	735,520	4	735,520
MASS.	1	29,635	1	29,635	---	---	---	---
MICHIGAN	2	294,000	2	294,000	4	449,080	4	449,080
MINNESOTA	5	290,950	5	290,950	6	637,136	6	637,136
MISS.	7	338,700	7	338,700	25	916,320	25	916,320
MISSOURI	4	448,000	4	448,000	9	667,100	9	667,100
MONTANA	---	---	---	---	3	113,030	3	113,030
NEBRASKA	---	---	---	---	4	128,680	4	128,680
NEVADA	2	33,800	2	33,800	2	174,030	3	206,230
N.H.	---	---	---	---	2	285,000	2	285,000
NEW JERSEY	2	431,000	2	431,000	4	745,300	4	745,300
NEW MEXICO	1	23,000	1	23,000	3	131,800	3	131,800
NEW YORK	6	668,870	6	668,870	4	653,970	4	653,970
N.C.	11	2,155,340	11	2,155,340	5	605,350	7	826,960
N. DAKOTA	8	550,470	8	550,470	10	292,020	12	306,000
OHIO	---	---	---	---	4	503,410	4	503,410
OKLAHOMA	4	383,750	4	383,750	5	296,340	6	311,340
OREGON	4	274,000	4	274,000	4	245,690	4	245,690
PENN.	11	1,808,700	11	1,808,700	5	901,350	5	901,350
S.C.	---	---	---	---	6	327,570	6	327,570
S. DAKOTA	7	471,330	7	471,330	6	204,570	6	204,570
TENNESSEE	6	489,380	6	489,380	9	504,200	10	541,200
TEXAS	18	1,646,900	18	1,646,900	15	976,770	15	976,770
UTAH	---	---	---	---	3	78,700	3	78,700
VERMONT	2	1,545,550	2	1,545,550	2	162,000	2	162,000
VIRGINIA	3	366,370	3	366,370	4	516,200	4	516,200
WASHINGTON	1	28,000	1	28,000	8	378,250	8	378,250
W.VIRGINIA	7	980,400	7	980,400	9	831,400	10	849,190
WISCONSIN	6	658,500	6	658,500	10	986,780	10	986,780
WYOMING	1	74,000	1	74,000	1	25,770	1	25,770
P. RICO	---	---	---	---	6	255,708	6	255,708

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UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

hibit A.7: -TOTAL WATER AND WASTE DEVELOPMENT GRANTS: GRANTS OBLIGATED BY STATES, FISCAL YEARS 1966-1975

STATE	1968 INITIAL NUMBER	1968 INITIAL AMOUNT DOL.	1968 TOTAL NUMBER	1968 TOTAL AMOUNT DOL.	1969 INITIAL NUMBER	1969 INITIAL AMOUNT DOL.	1969 TOTAL NUMBER	1969 TOTAL AMOUNT DOL.
U.S. TOTAL	292	21,995,890	328	22,997,300	327	23,391,448	353	23,964,658
ALABAMA	14	666,940	15	828,290	21	892,940	22	937,940
ALASKA	1	21,750	1	21,750	1	244,000	1	244,000
ARIZONA	2	128,330	2	128,330	3	193,400	3	193,400
ARKANSAS	13	859,620	15	872,120	13	659,970	14	679,170
CALIFORNIA	5	735,000	6	738,800	10	489,950	11	529,950
COLORADO	7	380,920	7	380,920	7	263,050	7	263,050
DELAWARE	---	---	---	---	1	200,000	1	200,000
FLORIDA	8	639,400	9	648,150	6	333,005	6	333,005
GEORGIA	23	888,600	25	904,000	8	485,620	10	491,530
IDAHO	5	403,270	5	403,270	4	155,150	5	158,210
ILLINOIS	5	522,340	6	531,340	7	595,580	7	595,580
INDIANA	4	414,600	4	414,600	7	575,250	7	575,250
IOWA	10	601,100	24	1,037,825	13	844,360	16	661,860
KANSAS	10	477,490	11	492,490	5	284,550	6	330,530
KENTUCKY	5	1,026,200	5	1,026,200	7	878,670	7	878,870
LOUISIANA	3	152,000	3	152,000	3	334,000	3	334,000
MAINE	6	472,050	6	472,050	5	623,670	6	634,670
MARYLAND	3	347,320	3	347,320	7	385,000	8	391,670
MASS.	---	---	---	---	1	436,500	1	436,500
MICHIGAN	2	437,000	4	510,000	3	540,000	3	540,000
MINNESOTA	8	675,730	8	675,730	7	673,270	7	673,270
MISS.	34	915,660	34	915,660	28	739,833	30	774,833
MISSOURI	4	523,000	4	523,000	11	858,000	11	858,000
MONTANA	1	65,500	1	65,500	1	38,120	1	38,120
NEBRASKA	5	125,450	5	125,450	6	188,320	7	193,320
NEVADA	---	---	---	---	2	60,000	2	60,000
N.H.	1	87,200	1	87,200	1	323,600	1	323,600
NEW JERSEY	3	700,000	3	703,000	2	360,000	2	360,000
NEW MEXICO	2	90,000	2	90,000	3	45,000	3	45,000
NEW YORK	4	812,550	4	812,550	6	1,435,510	6	1,439,910
N.C.	13	820,670	13	820,670	12	611,500	13	652,500
N. DAKOTA	7	256,030	12	284,300	8	282,940	10	302,000
OHIO	3	392,800	3	392,800	5	678,800	6	742,920
OKLAHOMA	5	414,300	5	414,300	6	593,600	6	593,600
OREGON	4	629,950	4	629,950	8	504,320	10	564,170
PENN.	7	680,500	7	680,500	6	863,750	7	913,750
S.C.	5	285,400	5	285,400	9	447,870	9	447,870
S. DAKOTA	2	729,350	2	729,350	7	188,450	7	188,450
TENNESSEE	2	85,200	3	142,815	6	570,000	7	646,000
TEXAS	19	1,249,380	19	1,249,380	14	1,027,590	14	1,027,590
UTAH	2	220,000	3	223,200	8	398,530	9	400,530
VERMONT	3	236,000	3	236,000	2	320,240	2	320,240
VIRGINIA	5	571,040	6	651,040	9	700,950	9	700,950
WASHINGTON	4	262,900	4	262,900	3	237,800	3	237,800
W.VIRGINIA	10	827,150	10	827,150	9	869,850	9	869,850
WISCONSIN	8	782,700	10	850,700	6	443,620	7	465,520
WYOMING	2	173,000	3	201,200	2	84,980	3	89,980
P. RICO	3	210,500	3	210,500	8	425,700	8	425,700

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UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Exhibit A.7: -TOTAL WATER AND WASTE DEVELOPMENT GRANTS: GRANTS OBLIGATED BY STATES. FISCAL YEARS 1966-1975

STATE	1970 INITIAL NUMBER	1970 INITIAL AMOUNT DOL.	1970 TOTAL NUMBER	1970 TOTAL AMOUNT DOL.	1971 INITIAL NUMBER	1971 INITIAL AMOUNT DOL.	1971 TOTAL NUMBER	1971 TOTAL AMOUNT DOL.
U.S. TOTAL	515	39.361.950	606	42.981.360	472	35.537.300	643	41.355.200
ALABAMA	23	1.202.600	26	1.418.600	20	1.193.400	29	1.333.800
ALASKA	---	---	1	424.400	1	475.600	1	475.600
ARIZONA	4	638.200	5	642.200	4	134.800	5	168.800
ARKANSAS	24	1.378.300	27	1.446.200	20	1.205.600	26	1.268.600
CALIFORNIA	10	1.005.250	15	1.098.780	11	703.800	18	1.022.400
COLORADO	12	574.000	14	598.200	8	438.500	10	538.500
CONN.	1	371.000	1	371.000	---	---	---	---
DELAWARE	---	---	1	81.300	1	81.300	4	216.300
FLORIDA	7	996.000	8	1.049.000	5	414.700	9	1.083.400
GEORGIA	15	1.728.000	18	1.751.500	11	967.000	12	974.000
IDAHO	13	461.700	16	514.400	9	373.600	14	490.000
ILLINOIS	13	1.260.600	14	1.270.600	11	1.063.100	15	1.134.100
INDIANA	10	1.064.000	11	1.099.000	10	1.077.200	11	1.150.200
IOWA	21	1.220.400	29	1.355.500	16	974.300	21	1.018.900
KANSAS	13	942.700	15	1.036.100	10	859.300	19	943.000
KENTUCKY	9	1.380.900	9	1.380.900	6	1.220.300	7	1.225.300
LOUISIANA	4	309.300	4	309.300	5	198.600	5	198.600
MAINE	3	236.000	6	651.000	5	1.223.600	6	1.226.600
MARYLAND	7	900.900	9	941.500	3	358.300	10	590.400
MASS.	1	155.000	1	155.000	1	90.000	2	99.000
MICHIGAN	4	690.000	4	690.000	8	885.600	9	900.600
MINNESOTA	13	793.400	13	793.400	10	801.600	15	865.800
MISS.	33	1.154.000	42	1.364.500	27	1.408.200	39	1.693.400
MISSOURI	16	1.361.100	16	1.361.100	16	1.352.100	24	1.807.700
MONTANA	3	155.300	4	166.010	3	89.700	3	89.700
NEBRASKA	7	849.100	7	849.100	7	335.100	8	341.100
NEVADA	1	171.200	4	303.870	1	74.900	2	124.900
N.H.	2	369.000	2	369.000	2	1.150.000	3	1.177.400
NEW JERSEY	3	678.000	5	867.200	3	527.000	7	652.100
NEW MEXICO	11	225.000	12	240.000	10	231.800	12	266.800
NEW YORK	12	2.270.000	13	2.305.000	13	1.401.500	13	1.401.500
N.C.	24	927.500	27	967.600	33	1.334.200	43	1.543.100
N. DAKOTA	6	323.500	9	382.000	6	532.600	8	593.600
OHIO	9	916.000	10	941.500	7	1.248.500	8	1.283.500
OKLAHOMA	16	878.600	18	991.600	14	695.500	25	1.052.500
OREGON	8	285.000	14	438.100	6	477.200	10	614.900
PENN.	26	1.458.400	30	1.829.600	11	1.417.000	17	1.600.100
R.I.	---	---	---	---	1	35.000	1	35.000
S.C.	12	839.400	13	841.700	10	835.900	11	865.900
S. DAKOTA	7	194.400	7	194.400	6	251.600	9	271.400
TENNESSEE	19	1.120.000	20	1.140.000	29	861.500	37	1.087.000
TEXAS	24	1.813.500	25	1.933.700	23	1.590.100	26	1.840.900
UTAH	6	792.000	7	802.000	5	336.400	5	336.400
VERMONT	2	295.100	3	345.100	4	409.000	4	409.000
VIRGINIA	11	1.158.300	13	1.194.800	16	1.023.700	20	1.161.200
WASHINGTON	11	733.200	13	748.300	9	611.400	14	1.013.700
W.VIRGINIA	14	1.380.300	16	1.421.300	12	1.076.200	19	1.254.700
WISCONSIN	8	757.800	9	882.800	12	859.800	13	890.800
WYOMING	5	402.800	6	419.700	5	320.500	7	435.500
P. RICO	12	542.000	14	601.500	6	514.700	7	587.500

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UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Exhibit A.7:--TOTAL WATER AND WASTE DEVELOPMENT GRANTS: GRANTS OBLIGATED BY STATES, FISCAL YEARS 1966-1975

STATE	1972 INITIAL NUMBER	1972 INITIAL AMOUNT DOL.	1972 TOTAL NUMBER	1972 TOTAL AMOUNT DOL.	1973 INITIAL NUMBER	1973 INITIAL AMOUNT DOL.	1973 TOTAL NUMBER	1973 TOTAL AMOUNT DOL.
U.S. TOTAL	393	32,825,800	551	39,862,900	272	25,590,500	359	29,329,900
ALABAMA	21	1,283,400	26	1,408,600	16	1,279,300	18	1,312,800
ALASKA	2	184,500	2	184,500	---	---	2	91,000
ARIZONA	5	270,000	5	270,000	1	101,000	1	101,000
ARKANSAS	10	1,127,400	15	1,202,500	12	1,066,500	14	1,084,000
CALIFORNIA	14	1,162,800	19	1,293,000	6	1,054,100	11	1,199,600
COLORADO	7	380,300	12	608,000	3	375,400	4	390,000
FLORIDA	6	992,100	9	1,044,600	4	610,200	6	677,900
GEORGIA	7	752,500	12	1,211,200	8	1,348,000	9	1,377,600
IDAHO	3	305,600	6	374,500	3	545,200	4	598,700
ILLINOIS	11	1,164,300	12	1,176,300	13	1,370,500	15	1,387,400
INDIANA	4	945,000	5	1,020,000	3	657,000	3	657,000
IOWA	18	914,400	30	1,100,000	14	876,000	18	961,600
KANSAS	5	648,900	8	724,000	7	385,400	11	733,200
KENTUCKY	8	1,030,000	10	1,087,700	4	660,000	5	735,000
LOUISIANA	11	518,000	11	518,000	5	385,000	5	385,000
MAINE	3	724,300	5	752,100	4	645,600	4	649,600
MARYLAND	3	697,400	5	862,500	---	---	1	10,000
MASS.	2	175,000	2	175,000	3	451,300	3	451,300
MICHIGAN	7	860,000	12	1,072,500	---	---	---	---
MINNESOTA	10	790,100	11	840,100	6	475,600	7	495,600
MISS.	27	1,529,200	34	1,706,000	18	1,258,000	26	1,590,000
MISSOURI	12	1,182,600	15	1,221,600	10	751,000	14	857,100
MONTANA	4	252,900	4	252,900	2	44,300	2	44,300
NEBRASKA	10	420,000	10	420,000	2	84,000	5	211,600
NEVADA	---	---	---	---	1	75,000	2	120,000
N.H.	2	10,000	2	10,000	---	---	---	---
NEW JERSEY	---	---	2	361,000	---	---	---	---
NEW MEXICO	10	243,600	11	305,600	---	---	---	---
NEW YORK	13	1,550,000	14	1,600,000	11	1,328,000	13	1,349,000
N.C.	18	942,200	32	1,335,300	17	958,100	25	1,096,100
N. DAKOTA	6	368,600	8	403,600	6	387,500	8	448,500
OHIO	4	532,000	9	1,250,000	1	75,000	1	75,000
OKLAHOMA	13	933,100	18	1,192,900	16	1,426,600	16	1,426,600
OREGON	7	388,400	13	393,400	5	423,700	7	493,200
PENN.	8	1,124,900	17	1,520,000	5	677,500	8	831,000
R.I.	1	145,000	1	145,000	---	---	---	---
S.C.	7	644,400	11	720,000	6	655,100	8	818,500
S. DAKOTA	6	413,900	9	472,400	5	315,700	6	325,000
TENNESSEE	25	836,000	32	990,000	16	523,000	23	647,000
TEXAS	17	1,548,400	20	2,074,000	8	1,122,000	12	1,709,600
UTAH	3	388,000	5	410,400	8	442,100	8	442,100
VERMONT	3	339,700	5	695,700	2	264,000	2	264,000
VIRGINIA	7	976,600	10	1,090,000	2	224,900	4	494,900
WASHINGTON	5	525,500	9	938,300	3	338,000	7	500,900
W.VIRGINIA	7	946,000	14	1,440,000	5	1,153,800	6	1,353,800
WISCONSIN	9	949,000	12	1,044,000	8	549,500	9	550,500
WYOMING	4	175,900	5	203,500	3	219,600	3	219,600
P. RICO	8	525,500	12	642,000	---	---	3	163,900

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UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Exhibit A.7:--TOTAL WATER AND WASTE DEVELOPMENT GRANTS: GRANTS OBLIGATED BY STATES, FISCAL YEARS 1966-1975

STATE	1974 INITIAL NUMBER	1974 INITIAL AMOUNT DOL.	1974 TOTAL NUMBER	1974 TOTAL AMOUNT DOL.	1975 INITIAL NUMBER	1975 INITIAL AMOUNT DOL.	1975 TOTAL NUMBER	1975 TOTAL AMOUNT DOL.
U.S. TOTAL	170	19,398,100	241	23,763,300	553	111,623,800	896	156,858,900
ALABAMA	11	518,000	17	801,900	22	3,163,200	39	4,496,000
ALASKA	1	118,000	1	118,000	---	---	1	200,000
ARIZONA	---	---	2	193,000	6	451,800	13	997,000
ARKANSAS	2	372,000	5	629,000	21	3,123,200	27	3,628,900
CALIFORNIA	4	342,000	6	473,800	21	4,842,600	31	6,087,200
COLORADO	6	209,000	7	309,000	11	1,592,300	15	1,835,000
CONN.	---	---	---	---	1	200,000	2	400,000
FLORIDA	2	567,700	3	660,000	11	4,843,300	17	6,641,500
GEORGIA	11	1,045,000	12	1,052,000	12	6,000,000	17	6,857,000
IDAHO	1	53,700	2	114,100	11	896,600	16	1,292,000
ILLINOIS	5	705,000	5	705,000	20	3,266,000	28	3,822,500
INDIANA	5	638,000	5	638,000	3	1,545,000	16	4,004,000
IOWA	2	137,000	2	137,000	38	3,340,400	52	4,175,900
KANSAS	2	531,000	2	531,000	12	3,768,900	18	4,261,000
KENTUCKY	10	1,082,000	11	1,102,000	13	3,400,000	25	4,675,000
LOUISIANA	2	87,000	2	87,000	24	2,730,400	25	2,815,400
MAINE	3	529,000	3	529,000	9	3,152,500	11	3,347,800
MARYLAND	2	250,000	2	250,000	3	755,800	6	2,314,000
MASS.	1	102,000	2	107,000	7	1,611,000	7	1,611,000
MICHIGAN	4	592,000	7	782,000	6	3,076,900	11	4,651,700
MINNESOTA	6	375,000	6	375,000	13	2,350,000	23	3,481,000
MISS.	9	581,000	13	736,500	31	3,553,000	51	5,083,200
MISSOURI	1	100,000	12	656,600	---	---	20	4,052,300
MONTANA	---	---	---	---	5	651,300	5	651,300
NEBRASKA	2	171,000	3	296,000	5	224,000	9	1,628,000
NEVADA	1	220,000	1	220,000	3	138,000	4	326,000
N.H.	---	---	---	---	5	603,000	5	603,000
NEW JERSEY	2	223,700	2	223,700	5	1,628,000	7	1,826,300
NEW MEXICO	---	---	---	---	9	750,500	11	829,500
NEW YORK	7	630,000	10	842,000	14	5,142,000	16	5,739,000
N.C.	6	1,193,000	6	1,193,000	16	4,236,900	26	6,384,000
N. DAKOTA	5	153,000	8	225,200	5	2,135,000	10	2,676,000
OHIO	7	975,000	7	975,000	12	3,497,000	22	5,109,000
OKLAHOMA	2	246,000	3	371,000	18	2,138,000	27	3,272,000
OREGON	3	220,000	5	279,000	16	1,390,400	28	2,188,000
PENN.	6	1,773,000	6	1,773,000	13	6,173,500	17	6,598,200
R.I.	---	---	---	---	1	220,000	1	220,000
S.C.	2	390,000	3	566,000	13	2,745,500	22	3,606,000
S. DAKOTA	4	66,800	6	130,800	9	2,934,500	9	2,934,500
TENNESSEE	8	428,000	16	871,000	33	3,202,000	65	5,179,000
TEXAS	3	1,536,700	5	1,804,300	22	4,675,300	42	8,034,000
UTAH	2	106,000	4	152,000	7	770,000	9	886,500
VERMONT	3	196,000	4	241,000	5	874,300	6	974,300
VIRGINIA	5	772,500	6	513,400	7	2,627,600	16	4,221,600
WASHINGTON	---	---	---	---	8	1,792,700	11	2,179,800
W.VIRGINIA	6	798,000	8	1,006,000	8	2,235,400	20	4,834,000
WISCONSIN	3	215,000	5	536,000	13	1,994,000	23	3,594,000
WYOMING	3	150,000	4	158,000	2	366,000	7	579,800
P. RICO	---	---	---	---	4	812,000	7	1,055,700

Construction Grants for Wastewater Treatment
Works/Environmental Protection Agency

1. PWI functional area addressed in this study.

   - Treatment plants construction.

2. Conceptual category of need satisfied by this PWI program.

   - Improvement of the quality of life (primary).
   - Protection of citizenry: health.

3. Type of Federal program.

   - Federal grants-in-aid for projects.

4. Authorizing legislation.

   - The Federal Water Pollution Control Act of 1956 (33 U.S.C. 1151), P.L. 84-660.

5. Implementing rules and regulations.

   - 40 CFR Part 35, Subpart E, Construction Grant Regulations.
   - 40 CFR Part 30, General Grant Regulations.

6. Program objectives.

   - The purpose of the 1956 Act, as amended, is to enhance the quality and value of the nation's water resources and to establish a national policy for the prevention, control, and abatement of water pollution. Grants are awarded to any state, municipality, or intermunicipal or interstate agency for the construction of necessary treatment facilities to prevent the discharge of untreated or inadequately treated sewage or other waste into any waters.

7. Program scope.

   - New construction.

8. Year program was initiated and years when major changes were made.

   - Although many bills dealing with water pollution were introduced prior to 1948, it was not until that year that specific legislation was enacted for water pollution control. P.L. 80-845 provided for an experimental water pollution control program in the Public Health Service of the Federal Security Agency, the precursor agency to the Department of Health, Education and Welfare (HEW).

- Permanent water pollution control legislation was enacted July 9, 1956, with the passage of the Federal Water Pollution Control Act (P.L. 84-660). The Federal Water Pollution Control Act Amendments of 1956 created the waste treatment construction grant program. The Act authorized grants for constructing waste treatment facilities to prevent sewage or other waste discharge into waterways. The grant recipient received Federal assistance of 30 percent of the project costs. Subsequent amendments to the Act increased the Federal share of project costs up to a maximum of 55 percent, and the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) established a Federal share at a flat 75 percent of project costs.
- The 1956 Act was amended by P.L. 87-88 approved on July 20, 1961. This new legislation strengthened and extended the previous law, especially in the areas of enforcement, grants, and research.
- The Water Quality Act of 1965 (P.L. 89-234) was approved on October 2, 1965. Pursuant to Section 2 of the Act, the Federal Water Pollution Control Administration was established in HEW on December 31, 1965. Previously, the Federal Water Pollution Control Program has been administered by the Division of Water Supply and Pollution Control, Bureau of State Service, Public Health Service, HEW. The Water Quality Act authorized: 1) grants for research and development of better methods for controlling pollution from combination storm and sanitary sewer overflows; 2) an increase in the amount of Federal grants for constructing waste treatment facilities; and 3) a program to establish water quality standards on interstate waters.
- The administration of the water pollution control program, as well as most functions of the Secretary of HEW authorized by the Federal Water Pollution Control Act, as amended in 1965, was transferred to the Secretary of the Interior by Reorganization Plan Number Two, which became effective May 10, 1966.
- On November 3, 1966, the Act was further amended by the enactment of the Clean Water Restoration Act (P.L. 89-753). That Act expanded the scope of the research and development program established by the Water Quality Act of 1965.
- In December 1970, the functions of the Federal Water Quality Administration were transferred to the Environmental Protection Agency which was established in accordance with Reorganization Plan Three for the purpose of organizing rationally and systematically the Federal government's environmentally related activities.
- In mid-October 1972, the last day of the session, Congress overrode President Nixon's veto of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500), the most comprehensive and expensive environmental legislation in the nation's history. The amendments initiated a major change in the basic

Federal approach to water pollution by adding strict limits on what could be discharged into waterways to existing standards for water quality. The 1972 Amendments established a national goal of eliminating the discharge of pollutants into navigable waters by 1985 and an interim goal of providing water quality sufficient for the protection of fish, shellfish, wildlife, and recreation by 1983. The 1972 Amendments (33 U.S.C. 1251 et seq.) established the Federal share at 75 percent of the eligible project costs and broadened the list of eligible project items. Publicly owned treatment works were required to achieve secondary treatment by July 1977 and to use the best practicable treatment technology by July 1983.

- In November 1972, President Nixon announced that, as an anti-inflationary move, he would not allocate $6 billion of the $11 billion authorized for FY 1973-1974. In January 1974, Nixon impounded $3 of the $7 billion authorized for FY 1975, bringing the total funds impounded to $9 billion. In February 1975, the U.S. Supreme Court ruled that the President had illegally impounded the funds.
- By way of Executive Order 11752 dated December 17, 1973, the Federal government is required to provide leadership in the nationwide effort to protect and enhance the quality of our air, water, and land resources through compliance with applicable standards for the prevention, control, and abatement of environmental pollution in full cooperation with state and local governments.

9. Type of Federal grant or loan mechanism.

   - Project grants.

10. Type of recipient.

    - Any municipality, state, interstate agency or Indian tribe having jurisdiction over disposal of wates.

11. Eligibility and application requirements for state and/or locality to receive Federal funds.

    - Federal and state planning for water pollution control is emphasized in the Act as a prerequisite to the approval of Federal grants to municipalities and other political subdivisions for the construction of waste treatment facilities. Also, the Act requires that each state certify that individual grant projects are entitled to priority over other eligible projects on the basis of financial and water pollution needs. Further, the Act states that no grant shall be made for constructing a waste treatment project unless the project has been approved by the appropriate state water pollution control agency. Guidelines developed to assist

the states in preparing their plans require that the states develop priority listings of treatment facilities which must be constructed to meet needs. The criteria used by the states in establishing priorities is to be submitted to the EPA. The criteria contained in state priority systems usually include: 1) water pollution control need; 2) financial need; and 3) readiness and willingness of the municipalities to proceed.

12. Federal funds allotment procedures.

- Local estimates of the cost of needed municipal treatment facilities have been consolidated into overall national totals almost every year since 1959. The Conference of State Sanitary Engineers made an estimate each year from 1959 to 1966 in its annual report. The Federal Water Pollution Control Administration and EPA have made annual estimates since 1969. The estimates by FWPCA and EPA have been based on information in their files about existing facilities and pending needs. Much of it was assembled and supplied by State Water Pollution Control Agencies. EPA supplemented the information in 1970 with two surveys and in 1971 with another survey of cities with the largest anticipated needs. The detailed definitions and criteria for costs and facilities which have been reported in these surveys provide an estimate of the costs for each state and that state's total as a percent of total national costs. Section 205 of the Act requires that sums be allotted among the states by the Administrator "in the ratio that the estimated cost of constructing all needed publicly owned treatment works in each state bears to the estimated cost of all states." The detailed estimate shall be biennially revised.
- Up until FY 1977, funds were allocated to each state in a manner consistent with the law: namely, the ratio that the estimated cost of construction of all needed publicly owned treatment works in each state bears to the cost of all needed works in all of the states.
- In FY 1977, the allotments were based on four factors: 1) 25 percent of the estimated 1975 Census population of the states; 2) 50 percent on the partial needs of each state for facilities in categories I, II, and IVB; 3) 25 percent on the full needs of each state for facilities in categories I, II, IIIA, IIIB, IVA, IVB, and V; and 4) an allotment adjustment.

13. Factors used in determining the Federal allotment.

- Cost factors considered by the state municipal treatment and collection authorities are seriousness, nature, and extent of the pollution problem, natural conditions, and construction costs. Further, the nature and size of facilities are

considered in light of population and industries to be served, wastewater pollutants and flows expected. All of these factors were used in municipal and state estimates; these were added together to yield a national total. Needless to say, this survey approach was used only for those facilities which were eligible for Federal assistance.

14. Agency or Congressional rationale for using this procedure and variables.

- No detailed rationale is given for this allotment approach in the Conference Report on P.L. 92-500. However, the general approach is consistent with the Amendments' principle that states establish a new, more complex, and continuing planning process that establishes priorities for EPA construction grants. The 1972 Amendments contemplated a Federal-state partnership which emphasized the advantages of obtaining an up-to-date (every two years) assessment of costs of facilities from the local level where costs can best be calculated, based on data about existing and projected treatment and collection costs, sewage to be treated and population to be served.

15. Degree to which states and localities influence project selection.

- The Federal Water Pollution Control Act of 1956 as amended requires each state to certify that individual grant projects are entitled to priority over other eligible projects on the basis of financial and water pollution needs. The criteria contained in most states' priority systems are basically concerned with three factors: 1) water pollutin control need, 2) financial need, and 3) readiness and willingeness of the municipalities to proceed. Because the priority systems are applied, in most cases, to only those municipalities filing applications for a grant, the priority listings generally represent only those municipalities that are ready to proceed.
- The individual at the Office of Water that completed the Advisory Commission on Intergovernmental Relations' 1975 questionnaire suggested that greater emphasis be accorded the grantee's financial capacity. Additionally, he indicated his belief that the apportionment formula was inconsistent with the statutory purpose and that appropriations should be substantially larger. It should be noted that EPA's regional offices have a major responsibility in approving state plans and reviewing the effectiveness of the program.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- Before the 1972 Amendments, municipalities' financial needs were a principal factor in establishing state priorities for EPA sewage treatment construction grants. The 1972 Amendments required states to establish a new priority system as a part of the continuing planning process. EPA required that, to be eligible for grants beginning July 1, 1973, sewage treatment projects be included in state project priority lists prepared in conformance with the new and more complex system.

B. Is NA a precondition for grant, loan or direct Federal expenditure?

- Yes.

C. Does program provide additional grants-in-aid for conducting the NA?

- Yes.

D. Who conducts the NA?

- The localities conduct the survey, estimating the costs and facilities which are eligible for Federal assistance, clearly defining and documenting the reasons for the size, cost, and nature of the facilities reported. EPA biannually, beginning in 1973, sends questionnaires to municipal authorities to complete. The completed forms are then reviewed by the states, who approve and forward them to EPA. EPA reviews each questionnaire to determine if facilities and costs fall within the survey guidelines and are justified by the data.

E. In what type of document is the NA contained?

- Biennial Survey of Needs, prepared pursuant to Sections 205 and 516 of P.L. 92-500.

F. How is need defined?

- On the basis of cost to construct, with a common basis for reporting costs detailed in the survey. The costs are restricted to those eligible for Federal assistance and which can be clearly defined and documented with information to justify the size, cost, and nature of the facilities included.

G. What technique is to be used for conducting the NA, i.e., measuring the need?

- EPA, in conjunction with a working group of state representatives, conducts the survey on a facility-by-facility basis. Survey guidelines are prepared in conjunction with the states, discussed in detail during meetings held with the states at EPA's regional offices.

H. What are the key factors (variables) to be considered in doing the NA?

- The nature, size and cost of facilities reported in the survey has to be reasonable for the population and industries to be served. Costs for treatment facilities have to be justified by data such as population (Bureau of Census "E" Series) to be served (1990), wastewater pollutants and flows expected, and reference to legally required effluent standards. Costs for collection facilities must be supported by such data as pipe sizes and lengths and special problems with construction and design.

I. With what frequency is the NA to be performed?

- Every two years.

17. Strengths and weaknesses.

- The construction grant program has been administered for the most part by awarding grants on a readiness-to-proceed basis, with little consideration given to the benefits attained by the construction of the individual waste treatment plants. This approach was useful in the early years of the program when there was a need to generate interest on the part of the states and communities to get the program moving. This approach, in part, undermined the likely attainment of the water quality standards by the legislated dates. In conclusion, the construction of municipal waste treatment facilities primarily on the basis of readiness-to-proceed will not be effective in abating, controlling, and/or preventing water pollution by the target date established in the law. (Source: GAO)

18. Information on Federal funding for the PWI program.

- On November 22, 1972, President Nixon instructed EPA to appropriate to the states $5 billion -- $2 billion for FY 1973 and $3 billion for FY 1974 -- of the $11 billion authorized for constructing sewage treatment plants for FY 1973-1974. Similarly, on January 1, 1974, the President instructed EPA to appropriate $4 billion of the $7 billion authorized for FY

1975 for a total appropriation of $9 billion and an impoundment of $9 billion. As previously mentioned, these impoundments, as well as EPA's slow pace in awarding Federal grants, have undermined EPA's ability to meet its attainment goals. (See Exhibit A.8, attached).

19. Primary data sources for completing summary sheet.

- Congress and the Nation, Volumes I through IV.
- Conference Report on P.L. 92-500.
- EPA Publications.
  - 1973 "Needs" Survey.
  - 1976 "Needs" Survey.
  - National Water Quality Inventory, 1976.
  - Rules and Regulations.
- Congressional Publications.
  - Data relating to the 1977 Clean Water Act.
  - Allotment of Grant Funds for Fiscal Years Ending September 30, 1977.
  - Allotment of Grant Funds for the Construction of Publicly Owned Wastewater Treatment Works.
  - Costs of Construction of Publicly Owned Wastewater Treatment Works.
- GAO Publications.
  - Examination into the Effectiveness of the Construction Grant Program, 1969.
  - Implementation of the Federal Water Pollution Control Act Amendments of 1972, December 1974.

Exhibit A.8: Municipal Sewage Treatment Construction Grants, 1948-1975

Fiscal Year	Authorization (millions)	Appropriation (millions)	Obligations[a] (millions)	Expenditures[b] (millions)
1948	22.5	0	0	0
1949	22.5	0	0	0
1950	22.5	0	0	0
1951	22.5	0	0	0
1952	22.5	0	0	0
1953	22.5	0	0	0
1954	22.5	0	0	0
1955	22.5	0	0	0
1956	22.5	0	0	0
1957	50.0	50.0	50.0	0.8
1958	50.0	45.7[d]	45.7	16.8
1959	50.0	46.8[d]	46.8	36.4
1960	50.0	46.1[d]	46.1	40.3
1961	50.0	45.6[d]	45.6	44.1
1962	80.0[c]	80.0	80.0	42.1
1963	90.0[c]	90.0	90.0	51.7
1964	100.0[c]	90.0	89.6	66.4
1965	150.0[c]	90.0	88.2	69.8
1966	150.0[c]	121.0	120.9	81.5
1967	150.0	150.0	150.0	84.5
1968	450.0	203.0	203.0	122.1
1969	700.0	214.0	214.0	134.5
1970	1,000.0	800.0	800.0	176.4
1971	1,250.0	1,000.0	997.0	478.4
1972	2,000.0	2,000.0	2,000.0	413.4
1973	7,000.0[e]	3,900.0[f]	2,989.0	684.0
1974	6,000.0	3,000.0	2,625.0	1,553.0
1975	7,000.0	4,000.0	3,759.0	1,956.0

[a] Agreements to fund projects. They will appear in future expenditures.
[b] Actual outflows of cash.
[c] P.L. 84-660 at first authorized $50-million for FY 1957-1966. Authorizations of $80-million for FY 1962, $90-million for FY 1963, and $100-million for FY 1964-1966 were made by P.L. 87-88. P.L. 89-234 increased authorizations for FY 1965 and 1966 to $150-million.
[d] Includes supplemental requests and appropriations.
[e] Includes $2-billion for reimbursement to municipalities for prior construction.
[f] Includes $1.9-billion for reimbursement to municipalities for prior construction.

Source: ACIR, Improving Urban America: A Challenge to Federalism, September 1976, p. 133.

Watershed Protection and Flood Prevention/Soil Conservation Service, Department of Agriculture

1. PWI functional area addressed in this study.

   - Civil works: dams and flood control.

2. Conceptual category of need satisfied by this PWI program.

   - Protection of property (primary).
   - Encouragement of economic development.
   - Improvement of quality of life.

3. Type of Federal program.

   - Project grants.

4. Authorizing legislation.

   - Watershed Protection and Flood Protection Act.
   - P.L. 83-566 (16 U.S.C. 1001).

5. Implementing rules and regulations.

   - "Soil Conservation Service, What It Is and What It Does," SCS-C1-9.
   - "Local-State-Federal Watershed Projects," SCS-C1-4.
   - "Multiple-Purpose Watershed Projects," PA-575.
   - "Community Benefits from Watershed Projects," Bulletin 33.
   - "Watershed Protection Handbook," June 1957.
   - "Economics Guide for Watershed Protection and Flood Prevention," December 1958.

6. Program objectives.

   - To provide technical and financial assistance in planning and carrying out works of improvement to protect, develop, and utilize the land and water resources in small watersheds.

7. Program scope.

   - Assistance is provided in planning, designing, and installing watershed works of improvement; in sharing costs of flood prevention, irrigation, drainage, sedimentation, control and extending long-term credit to help local interests with their share of the costs. Watershed area must not exceed 250,000 acres and the capacity of a single structure is limited to 250,000 acre-feet.

8. Year program was initiated and years when major changes were made.

- The Soil Conservation Act of 1935 created the Soil Conservation Service within the Department of Agriculture and directed it to aid farmers in solving soil and related water conservation problems on their land. The program was designed to help land owners and operators plan and install permanent soil improvement measures that would combat erosion, flooding, excess water, loss of vegetation, and other forms of natural or man-made damage limiting the usefulness and productiveness of land. Control measures might include installation of drainage or water runoff control facilities, planting of trees, installation of small dams, trenching, terracing and related measures.
- In 1936, a major enlargement of SCS functions was authorized by the Flood Control Act of 1936 (P.L. 74-738). The Flood Control Act provided a division of responsibilities between SCS and the Corps of Engineers. The Corps was to have primary responsibility throughout most of the country for controlling floods through downstream water control methods, like large storage dams. The Agriculture Department's SCS was to have primary responsibility for controlling floods through the use of upstream methods of special treatment and watershed control. This meant that the SCS now had responsibility not only for Federal anti-erosion activities on most farm and range lands, but also for upstream flood prevention activities.
- As no specific upstream flood prevention projects were started by the Agriculture Department under the 1936 Flood Control Act, the 1944 Flood Control Act authorized the Department to proceed with upstream flood prevention projects on 11 large rivers.
- Through the Agriculture Appropriations Bill (P.L. 83-156), SCS was provided $5 million to initiate a pilot program of combined upstream flood prevention and soil conservation treatment in five dozen small watersheds. Of the 62 projects that were initiated under this pilot program, eight were discontinued.
- The Watershed Protection and Flood Prevention Act of 1954 (P.L. 83-566) authorized the SCS to carry out permanent small watershed programs. The bill provided for local organizations, such as soil conservation districts, to build small watershed projects with the technical and financial assistance of the SCS. The projects were to unite a number of features: upstream flood prevention work, provision of water for agricultural (irrigation) purposes, and soil conservation on private lands in the watershed. The Federal government was to pay part of the costs, chiefly for flood prevention aspects, the local organization the remainder.

The new small watershed program was the first permanent Federal program providing for a coordinated, balanced development of water and soil resources in areas larger than a single farm. Further, the 1954 program was the culmination of upstream river control studies and experiences begun under the 1936, 1944, and 1954 Acts, and signified that Congress had decided upon a permanent mechanism for use of upstream water control methods. The permanent program was based on Federal-local cooperation and with formal procedures for cost-sharing between the SCS and local water-user groups. Projects would be initiated at the request of local sponsors -- normally soil conservation districts, state-chartered groups, or state agencies. The local sponsors would build the project and finance it with SCS aid. Projects were not to exceed 250,000 acres in size and no single reservoir could exceed 5,000 acre-feet of total water capacity.
P.L. 83-566 placed major pre- and post-construction responsibilities on the local sponsoring organization. The bill stated that any reservoir included in a small watershed project that was not attributable to flood control purposes (like those portions for irrigation) must be paid for by the locality. Before a project could be built, a favorable benefit-cost ratio had to be demonstrated.

- In 1956, the small watersheds program was broadened by P.L. 84-1018. Instead of being limited to flood prevention and water management projects, the program was extended to cover projects that included municipal and industrial water supply, recreation, fish and wildlife improvement, and pollution abatement. The Farmers Home Administration could make loans to local participants for their share of the projects, with loans limited to 50 years and interest rates based on the rate paid by the government on outstanding government securities.
- In April 1956, the Secretary of Agriculture directed the SCS to take the leadership in setting up a continuing national inventory of soil and water conservation needs covering each county in the U.S. The initial inventory was completed in 1961 and published in 1962.
- By the way of two laws in 1958 (P.L. 85-624 and P.L. 85-865), the fish and wildlife activities of the Department of the Interior were to be considered and included in any small watershed project that the Agriculture Department assisted.
- Two amendments were adopted in 1960 to the 1954 small watershed law. The more important amendment (P.L. 86-468) enabled the 11 large watershed projects initiated under the 1944 Act to include irrigation, fish and wildlife, and non-flood prevention features. The second amendment (P.L. 86-545) liberalized the conditions under which local sponsors of small watershed projects could meet their commitments to obtain needed land easements and rights-of-way.

- The Flood and Agriculture Act of 1962 (P.L. 87-703) permitted SCS for the first time to share in the costs of recreation features in small watershed projects. The general cost-sharing picture for small watershed projects was as follows: the SCS could pay for all costs attributable to flood prevention and could share in costs attributable to agricultural water management (irrigation, drainage), fish and wildlife development, and recreation. However, all costs attributable to furnishing water for municipal and industrial use had to be paid for by the sponsor from fees received from the sale of water to these users.
- President Johnson, in his 1965 Budget Message, called for the enactment of legislation that would provide Federal and regional coordination of plans for water resource development. P.L. 89-80, called the Water Resources Planning Act, established the Water Resources Council. The Council, composed of the Secretaries of Interior, Agriculture, Army, HEW, and the Chairman of the Federal Power Commission, was to evaluate regional and river basin plans in relation to water needs, and coordinate the administration of Federal water programs.
- President Nixon signed the Rural Development Act on August 30, 1972. The Act provided for expansion of various existing programs and authorized new programs. Title III of P.L. 92-419 authorized the Soil Conservation Service to share up to one-half the cost of water storage for municipal and industrial water supplies.
- President Ford pocket-vetoed a bill to encourage long-range planning and appraisal of the nation's land and water resources for budgetary reasons.

9. Type of Federal grant or loan mechanism.

- Discretionary grants. Grants to qualifying associations may not exceed $750,000 without Congressional approval.

10. Type of recipients.

- A watershed project is primarily a local undertaking (the project is initiated and carried out by the sponsoring local organization). As a condition for obtaining Federal assistance, the local organization must acquire water rights and furnish land, easements and rights-of-way for all structural measures. An eligible local applicant includes any state agency, county or groups of counties, municipality, town, soil and water conservation district or any other nonprofit agency with authority to maintain or operate watershed works.

11. Eligibility and applicatin requirements for state and/or locality to receive Federal funds.

- The Watershed Protection and Flood Prevention Act of 1954 authorizes the Secretary of Agriculture to cooperate with local organizations for the purpose of planning and carrying out works of improvement for soil conservation, preventing flood damages, and furthering the conservation, development, utilization, and disposal of water. The Secretary would assist local organizations if their application had been submitted to, and approved over such programs, or by the Governor within 45 days. The Secretary would: 1) conduct such investigations and surveys as are necessary to prepare plans for improvement; 2) prepare plans and estimates needed for adequate engineering evaluations; 3) cooperate and furnish financial and other assistance to local organizations; 4) obtain cooperation and assistance from other Federal agencies; and 5) determine whether benefits exceed costs.
- Congressional approval is not required for watershed projects unless the construction costs exceed $250,000 or if the work plan includes a structure providing more than 4,000 acre-feet of total capacity. Similarly, review by other agencies (typically, Interior) is not required unless the above provisions are met.
  As a condition for receiving Federal assistance for the installation of works of improvement, local organizations are required to acquire land, easements, and rights-of-way; share in the construction costs of other than flood prevention features; award contracts or delegate contracting to SCS for construction; and operate and maintain the project when completed.

12. Federal funds allotment procedures.

- Basically, the allotment of project funds is discretionary. When technical facilities are available in a state for planning additional watersheds, the Governor will recommend planning priorities. The Governor, or the state agency designated by him, will choose among those applications which meet the requirements of the law and the policy of the Department. This list of projects is referred to the USDA State Soil Conservationist who will select projects which most efficiently use SCS resources. The state SCS conservationist fills out Form 404, as is appended, and mails it to the national headquarters.
  Historically (through the late 1950's), project funding was done on an incremental basis, whereby the prior year's allotment to the state was increased by a construction cost (index) factor. In the late 1950's, this approach was changed, placing principle responsibility on the USDA State Soil Conservationist. The advantages cited for the change were that localities (and therefore the Governor or the designated agency) were optimistic about their ability to proceed. Their inability to obtain rights-of-way and easements led to a

substantial portion of obligated funds not being spent. By increasing reliance on the SCS state conservationist, a more realistic assessment of "ready-to-proceed" projects is assured. Further, an optimism of the localities caused more monies to be obligated than were expended, thus inflating the SCS budget. Form 404 also enables the national office to compare the benefit-cost ratio of projects nationally. More recently, the Soil Conservation Service has begun to "call back" to Washington funds not spent from the sponsored states. (This is similar to the approach taken by Farmers Home Administration.) These funds are disbursed to states that have projects that are ready to proceed. The states from which the unexpended funds are pooled will be questioned in the coming fiscal year about their overestimation, with the likely consequence being that their request will be adjusted downward. The national SCS director intends to "reward" states that realize their construction plans. As previously mentioned, the Senate and House Agriculture Committees must approve large watershed projects.

13. Factors used in determining the Federal allotment.

- The SCS Watershed Handbook identifies these factors as indicators of relative need within the context of benefit-cost ratios.
  - The project will make a major contribution to conservation, development, and utilization of water resources.
  - The project will benefit a large number of people and benefits extend beyond the project boundaries.
  - Economic justification appears to be highly probable.
  - The cost of flood protection is compatible with the value of the benefited land.

14. Agency or Congressional rationale for using this procedure and variables.

- The small watershed program actually had its origins in the Flood Control Act of 1936, when Congress assigned to the Agriculture Department the responsibility for controlling floods through upstream water control methods. The Flood Control Act of 1936 envisioned a division of responsibility between the Corps of Engineers (construction of large storage dams and embankments downstream) and upstream flood prevention projects by the Agriculture Department. The Department undertook no specific upstream flood prevention construction projects under the Act until 1945.
  Like the Corps, the SCS evaluates all watershed projects principally on the basis of benefit-cost ratios. The reason is that both agencies comply with the Congressional mandate incorporated in the 1936 Act which stated that benefits of Federal projects should exceed costs. This Act and the regulations subsequently promulgated by the two agencies have

led to the development of analytical procedures for evaluating the benefits and costs of proposed water resource, and related land resource, projects. These procedures centered around national economic efficiency analyses and were first published in a report entitled "Proposed Practices for Economic Analysis of River Basin Projects," May 1950, subsequently revised in 1958.

15. Degree to which states and localities influence project selection.

- In 1937, at the request of President Roosevelt, the states began passing laws providing for the chartering by the state governments of local farmers organizations to be known as soil conservation districts. Mr. Roosevelt's objective was to have the SCS work with the farmers through the districts. These districts are organized under state law by local people.
- The respondent to the 1975 Advisory Commission on Intergovernmental Relations believed that the channeling of applications through the state had little to no effect on local participation. He did, however, believe that recipients should coordinate their projects with other state and local activities.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- Section 6 of the Act authorizes the Secretary to cooperate with other Federal agencies and the sponsoring local agency to conduct a needs study.

B. Is NA a precondition for grant, loan or direct Federal expenditure?

- Yes.

C. Does program provide additional grants-in-aid for conducting the NA?

- Yes. Technical assistance is not only a part of the SCS operating budget, but also constitutes nearly 30 percent of annual project funds.

D. Who conducts the NA?

- Title I of USDA Regulations requires the SCS to conduct the necessary surveys and investigations in cooperation with local organizations and concerned state agencies.

E. In what type of document is the NA contained?

- Specific project application.

F. How is need defined?

- Tangible benefits.
  - Reduction in direct and indirect damages from erosion, floodwater, and sediment.
  - Increase in net income from more intensive use of property made possible by flood prevention.
  - Downstream flood plains benefits.
- Employment benefits.
- Intangible benefits.
  - Prevention of loss of life.
  - Increasing economic opportunities.

G. What technique is to be used for conducting the NA, i.e., measuring the need?

- Expert opinion and judgment.

H. What are the key factors (variables) to be considered in doing the NA?

- Erosion, floodwater, and sediment damages.
- Loss of life.
- Damages to property.
- Preserving and protecting land and water resources.
- Local citizens' perception of need.
- Assistance to rural community development.

I. With what frequency is the NA to be performed?

- On a project-by-project, as-needed basis for both individual small watershed installations and those on the large rivers designated in the Flood Control Act of 1944.

- The Department of Agriculture, by way of the Soil Conservation Service, assisted by other Federal, state, and local agencies, conducts a nationwide conservation needs inventory at five-year intervals. The objective is to provide data on the soil, water, and related resources of the U.S. to help in planning land use, conservation of soil and water, community development, and environmental improvement. Data are collected on the kinds, amounts, and geographical extent of soil, water, and related resources; the potential and limitations of these resources for various uses; and the changes and trends in the use, extent, and condition of those resources.

17. Strengths and weaknesses.

- Major criticisms have not been made regarding the Soil Conservation Service because the design and implementation of the program clearly reflect Congressional intent.

18. Information on Federal funding for the PWI program.

- P.L. 84-1018, enacted in 1956, significantly increased the SCS participation in small watershed projects. The amendment of P.L. 83-566 required the Federal government to bear the entire cost of structures applicable to flood prevention -- these costs had formerly been shared with local interests. The 1956 Amendment required the Federal government to include the installation of land treatment measures for watershed protection (trees, plants, etc.) -- these monies formerly were paid from other than P.L. 83-566 funds.
- In order to assuage urban interests, this formerly rural program has been expanded to help more and more municipal and county officials. SCS advises urban leaders on the controlling of erosion on roadways, subdivisions and airports because erosion clogs streams and reservoirs and increases the costs of water purification, as well as road maintenance. Exhibit A.9, attached, provides data on SCS state-by-state obligations.

19. Primary data sources for completing summary sheet.

- Congress and the Nation, Volumes I through IV.
- Watershed Protection Handbook, SCS, July 1957.
- USDA Procedures for Planning Water and Related Land Resources, as revised.

- Economics Guide for Watershed Protection and Flood Prevention, as revised, December 1958.
- Agriculture Information Bulletin, 345.
- Secretary's Memorandum No. 1665, October 9, 1964, Resource Conservation and Development Projects.
- GAO Reports.
  - Audit Report for FY 1955, Soil Conservation Service, USDA.
  - Review of Selected Watershed Plans, May 1961.

7/13/78 LIST OF FINANCIAL ASSISTANCE OBLIGATIONS PAGE
USDA-SCS-WATERSHED DIVISION-SWAMI O.P.LEE 11/77

ST	FY73	FY74	FY75	FY76	FYTQ	FY77	TOTAL
AK							
AL	1,174,155	1,947,013	1,682,501	2,125,833	16,663	1,406,834	8,483,799
AR	2,715,710	4,242,729	6,869,716	7,338,729	142,149	1,994,377	23,613,416
AZ	2,141,363	1,526,262	835,218		3,447	3,575,821	8,512,171
CA	3,016,227	3,240,101	2,447,076	6,023,928	1,194,796	7,002,197	23,926,325
CO	571,416	1,481,484	1,782,442	627,953	90,000-	300,329	5,073,618
CT	241,862	1,153,959	24,324	641,747	3,257	107,347	2,212,606
DE	463,150	325,105	83,218	64,698	517,113	438,612	1,914,484
FL	344,971	154,249	215,732	190,462		664,495	1,579,909
GA	1,312,378	1,560,147	2,602,770	1,900,637	175,461	804,932	8,645,535
HI	6,671	13,531-	360,410	101,457	8,695	61,986	1,093,696
IA	1,096,153	2,804,467	3,369,102	3,111,735	122,630	6,196,194	16,698,221
ID	34,059	830,284	27,390	54,216		1,208-	948,701
IL	1,697,394	180,610-	3,193,211	2,441,130	79,284	6,700,628	13,931,137
IN	1,452,511	1,585,776	541,621	504,122	664,594	2,590,501	7,339,125
KS	3,459,441	3,111,753	4,101,997	4,187,410	262,700	4,001,258	19,124,584
KY	876,472	1,411,772	4,721,806	7,716,570	107,572	403,476	15,739,146
LA	575,469	2,422,210	3,726,910	3,517,245	543,106	2,617,726	13,602,612
ME	171,695	72,473	2,780,610	129,155	122,807	123,174	3,400,314
MD	1,091,753	643,618	666,525	8,966	215-	94,667-	2,476,440
MI	135,684	154,311	4,605-	30,036		116,047	435,393
MI	567,129	323,147	115,612	57,209-	279,235	561,836	1,779,750
MN	1,446,771	722,430	154,920	381,131	235,542	623,320	2,567,314
MO	1,021,367	1,453,734	1,072,666	1,225,590	219,006	1,265,953	6,248,276
MS	1,570,552	2,679,208	4,196,965	1,863,007	1,242,233	2,466,947	14,481,042
MT	1,307,901	602,371	1,630,292	891,827	333,415	201,340	5,287,146
NC	601,776	1,458,673	1,964,430	1,257,635	338,686	406,453	6,031,713
ND	1,347,864	672,483	722,504	440,294	33,677	2,303,169	5,969,935
NE	1,317,547	1,612,505	1,850,881	2,517,545	15,395	3,790,134	11,104,107
NH	151,389	687,929	77,667	342,500	19,998	91,509	1,417,002
NJ	2,606,435	1,411,703	1,592,962	1,942,013	1,612,561	309,981	7,690,655
NM	1,973,910	3,582,345	193,279	1,320,909		628,320	7,168,763
NY	1,986,958	1,619,649	636,379	863,311		1,892,719	6,384,016
NV	450						450
OH	377,669	2,206,373	1,220,713	1,718,856	440,570	1,878,694	7,830,875
OK	4,121,350	6,194,234	5,545,242	4,628,272	204,253	5,327,721	26,021,116
OR	1,514,641	613,582	1,154,501	259,537-	403,462	944,444-	2,517,245
PA	2,556,972	4,975,729	1,554,813	3,295,191	380,698	2,576,776	15,737,978
PR							
RI							
SC	852,771	811,446	493,191	697,011	571,538	1,095,400	4,551,357
SD	26,663	701,739	44,906	155,404	913	8,921	937,712
TN	491,635	1,800,860	832,743	2,651,481	4,977-	5,664,997	11,042,759
TX	4,025,914	3,068,(4)	5,835,728	4,697,505	2,227,041	9,970,407	30,725,236
UT	664,700	2,167,802	309,712	1,564,741	754,629	880,600	6,342,184
VA	941,396	644,442	49,045	563,163	235,112	87,903	2,962,423
VT	30,160-	302,956	11,249	7,366-	25,450	25,000	315,273
WA	223,279	25,273	593,774	114,059	64,21	2,664,561	3,120,760
WI	966,970	1,051,463	235,957	560,916	47,244	214,524	3,066,504
WV	1,573,501	1,735,406	2,130,473	377,136	139,065	1,428,971	7,350,782
WY	16,240	703,403	4,790-	59,003		592,409	1,366,265
FINAL	57,258,521	74,426,725	74,134,596	75,078,421	13,649,316	65,564,191	379,135,230

Flood Control Works, Navigation Projects/Office of the Chief of Engineers, Department of the Army

1. PWI functional areas addressed in this study.

   - Harbor facilitis: ports.
   - Civil works: dams and flood control.

2. Conceptual category of need satisfied by the PWI program.

   - Promotion of commerce (primary).
   - Protection of property.
   - Improvement of quality of life.

3. Type of Federal program.

   - Direct Federal expenditures.

4. Authorizing legislation.

   - 33 U.S.C. 701.
     - River and Harbor Act of 1899.
     - Flood Control Act of 1941 (P.L. 77-228).
     - Flood Control Act of 1944.
     - Flood Control Act of 1946 (P.L. 79-526).
     - Flood Control Act of 1948 (P.L. 80-858).
     - Flood Control Act of 1960 (P.L. 86-645).

5. Implementing rules and regulations.

   - 33 CFR 263.
   - Engineer Regulations 1105-2-50.

6. Program objectives.

   - The Army Corps of Engineers was the largest agency and the first created. Although it came into existence in 1802, it was not until 1824 that Congress passed the first rivers and harbors act providing for navigation improvement; this was the beginning of the Army Engineers' project work on rivers and channels all over the country. The Flood Control Act of 1936 gave major responsibility to the Corps to control floods in river basins. The Corps plans, constructs, and operates water resources projects authorized by the Congress for navigation, flood control, and such related purposes as irrigation, hydroelectric power development, and recreation. In addition, the Congress has authorized the Corps to participate in the construction of non-Federal, multi-purpose projects that provide flood protection benefits. With the exception of certain small projects of limited scope which may be

accomplished with continuing Secretary of the Army and Corps authorities, water resources projects require specific Congressional authorization.

7. Program scope.

   - New construction.

8. Year program initiated and years when major changes were made.

   - Flood Control Act of 1947 (P.L. 78-534), as amended.
   - River and Harbor Act of 1960 (P.L. 86-645), as amended.
     - The Flood Control Act of 1944 was one of the most important Federal water and power policy bills ever passed, the major governing statute in post-war Federal water policy. It set forth a basic Federal policy for the construction of flood control and multi-purpose river projects by the Corps, established rules to govern the marketing of power from such projects, and firmly fixed into Federal policy the principle of development of water resources for multiple purposes.
     - The 1958 Water Supply Act gave the Corps the authority, for the first time, to build storage capacity into reservoirs in order to provide for municipal and industrial use, present and anticipated.
     - The 1961 Water Pollution Control Act amendments authorized that the Corps' general authority to plan water storage be expanded to include storage for water quality and flow regulation purposes (anti-pollution purposes).
     - The River and Harbor and Flood Control Acts of 1962 (P.L. 87-874) authorized the Corps to set aside $3 million a year for Federal participation on local beach erosion projects which were not authorized but which the Engineers believed were advisable. P.L. 87-874 rewrote the provision of the 1944 Flood Control Act which had permitted the Corps to build or provide for recreation features at Federal Corps-built reservoirs. The Corps could not include or provide for recreation features at any water project of any type which the Engineers built, not just reservoirs.
     - In 1965, the Congress passed a Johnson Administration bill (P.L. 89-72) establishing, for the first time, a uniform Federal-local, cost-sharing formula for recreational facilities. The Federal Water Project Recreation Act provided that recreation and fish and wildlife enhancement would be given "full consideration" and that the economic benefits would be taken into account in determining the cost-benefit ratio of the project under planning.
     - In 1974, P.L. 93-251 passed, which contained innovative provisions aimed at controlling flood control and navigation projects' costs and minimizing environmental

damage. The measure instituted a new two-step authorization procedure for most types of Corps water projects, in which Congress first approved engineering and design of a project and later its construction. The bill also provided for automatic cancellation of projects authorized for longer than eight years but never funded by Congress.

- In 1976, the Water Resources Development Act (P.L. 94-587) passed, containing two modifications to the benefit-cost analyses of major policy significance. Section 134 provides a mechanism whereby the Corps can certify that plans for a locally constructed project would be compatible with a potential Federal project and that subsequent benefit-cost analyses of the potential project would be made as if the local work had not been done. Further, Section 140 authorizes the Corps to include regional economic benefits in analyses of authorized navigation projects under preparation.

9. Type of Federal grant or loan mechanism.

   - Direct expenditures, except when recreation involved.

10. Type of recipient.

    - States and localities with full authority and ability to undertake necessary legal and financial responsibilities (operation and maintenance of the project, provide rights-of-way, provide access roads, etc.).

11. Eligiblity and application requirements for state and/or locality to receive Federal funds.

    - Requests are generally made in the form of a letter to the district engineer which documents the need for assistance. An environmental impact statement may be required from the locality.

12. Federal funds allotment procedures.

    - Discretionary funding by Congress. Water resource developments may not be implemented without being specifically adopted into law.
    - Although the majority of Corps water resources projects or programs require specific (enabling) Congressional authorization(s), Section 201 of the 1965 Flood Control Act delegated to the Secretary of the Army the right to administratively authorize water resource developments for which the estimated Federal cost is less than $10 million. Additionally, Congress has delegated continuing authority to the Secretary of the Army for construction of small projects for navigation, flood control, beach erosion, and bank protection that meet certain specified criteria.

13. Factors used in determining the Federal allotment.

- Physical Needs. (As projected out to the year 2020 based upon anticipated regional population, employment, and income.)
- Income Redistribution - Equity. (Based on projected population and personal income growth, resources allocated to regions in direct proportion to population and in inverse proportion to anticipated personal income growth.)
- Regional Allocations. (In proportion to the relative magnitude of each region's expressed need in physical terms. A regional mean value (RMV) is developed, converting physical objectives (acre-feet, user-days) into a common dimension.)
- Establishment of Basin Budgets. (Once a regional allocation is established, dollars must be allocated among the basins in the region. Basin allocations include physical needs and equity factors.)
- Establishing Regional Project Priorities. (Projects are assigned priority on the basis of effectiveness and efficiency, respectively measured by the cost-effectiveness ratio (CER) and benefit-cost ratio (BCR).)
- Project Selection. (This is the final step, by which projects of high priority for each basin and region are compared on the basis of six factors, three of which are given double weight. The six factors are: disaster potential, needs, local attitude [these three are given double weight], economic efficiency, impact, and intangibles.)

This selection process only identifies projects to be initiated during the five-year program period. As it does not identify the specific year in which projects are to be begun, a Program and Financial Plan needs to be generated.
Recent program emphasis is on flood control and municipal and industrial water supply for urban areas and on hydropower. The energy crisis has placed greater focus on all hydropower projects, as well as on transportation and other project functions which contribute to solving energy problems. Commercial navigation is given precedence over recreational navigation, and to projects providing benefits to non-price supported agricultural production. Projects nearing completion are given priority so that they can begin accruing benefits whereas projects with unresolved environmental or other problems are not so favored.

14. Agency or Congressional rationale for using this procedure and variables.

- In the Flood Control Act of 1936 (33 U.S.C. 701A), the Congress declared that benefits of Federal projects should exceed costs. This Act led to the development of analytical procedures for evaluating the benefits and costs of proposed water resource, and related land resource projects. These procedures centered around a national economic efficiency

analysis and were first published in a report entitled "Proposed Practices for Economic Analysis of River Basin Projects" in May 1950, revised in May 1958; the report was prepared by an interagency committee on water resources.

- For nine years, beginning in late 1952, the Bureau of the Budget (predecessor of OMB) used Circular A-47 to evaluate water resource projects. The circular permitted project comparisons because of uniform data. In 1962, "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources" superseded Circular A-47. These evaluation standards were referred to as Senate Document 97 and provided the governing criteria for water resource project formula. The purpose of Senate Document 97 was to establish executive policies and standards for uniform application in the formulation, evaluation, and review of comprehensive river basin plans for use and development of water and related land resources in order that the executive and legislative branches of the government would be better able to make informed judgments on the merits and desirability of projects.
- The Water Resources Planning Act of 1965 (42 U.S.C. 1962) required the Water Resources Council to establish principles, standards, and procedures. The Council's "Principles and Standards for Planning Water and Related Land Resources," after approval by the President, became effective October 25, 1973, replacing Senate Document 97. The Council's principles and standards require that procedures provide more detailed methods for carrying out the various levels of planning -- including the selection of objectives, the measurement of beneficial and adverse effects, and the comparison of alternative plans -- be developed by the water resource agencies and reviewed by the Council for consistency and uniformity. The Council's standards require that Federal and Federally-assisted water activities be planned toward achievement of National Economic Development (NED) and Environmental Quality (EQ) as co-equal national objectives. NED is to be achieved by increasing the value of the nation's output of goods and services and improving national efficiency; EQ is to be achieved by the management, presentation, creation, restoration, or improvement of the natural and cultural resources and ecological systems.

15. Degree to which states and localities influence project selection.

- The need for cooperation and coordination between all Federal agencies concerned with water resources development has become more apparent as the Federal interest in this activity has grown. The interests of the affected states and involved local interests are of significant concern and must be recognized and considered. In recent years, this has been amplified by a general concern for the environment, regional economic development, and social well-being. For example, in

the Flood Control Act of 1944, and the River and Harbor Act of 1945, Congress clearly stated that it is Federal policy to recognize the interests and rights of the states in the development of the watersheds within the borders, and their interests and rights in water utilization and control.

- The Water Supply Act of 1958 (P.L. 85-500) declared it to be policy of the Congress to recognize the primary responsibilities of the states and local interests in developing water supplies for domestic and industrial purposes and that the Federal government should participate and cooperate with state and local interests in developing water supplies in connection with the construction of Federal water resources projects. It is interesting to note that Federal projects for the development and use of water resources are seldom initiated without strong state support and generally are not undertaken in opposition to state desires.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws, in the rules and regulations.

- More recently, very clear. As stated above, a needs assessment is required by several public laws.

B. Is NA a precondition for grant, loan or direct Federal expenditure?

- Yes.

C. Does program provide additional grants-in-aid for conducting the NA?

- The Corps' operating budget provides for planning staff.

D. Who conducts the NA?

- The Corps' Division Engineers furnish estimates of physical needs.

E. In what type of document is the NA contained?

- Framework Studies and Assessments, which are studies of regional and national scope. They are directed by the Water Resources Council, with the Corps being a major participant.
- Regional or River Basin Studies are usually directed by the Water Resources Council with participation by the Corps. They are reconnaissance-level evaluations of water and land resources more detailed in scope and more limited in area than framework studies.

F. How is need defined?

- Control of water damage.
  - Flood damage reduction - acres of land which are subject to stream and bank flooding.
  - Hurricane damage reduction - acres of developed land subject to hurricane-induced tidal water damages.
- Water supply.
  - Municipal and industrial water supply - water withdrawn, including groundwater, needed to satisfy the requirements of projected population and industrial development.
  - Agricultural water supply - water withdrawn including groundwater, required for irrigation and livestock water.
- Water-related recreation.
  - General recreation - total recreation days needed to meet resident and non-resident demands.
  - Fish and wildlife - total recreation days of sport fishing and sport hunting to meet resident and non-resident demands in a region.
- Navigation.
  - Harbors - projected annual tonnage.
  - Channels - projected annual tonnage multiplied by distance.
  - Locks - projected annual tonnage.
- Power.
  - Average annual load - capacity required to meet average annual generation needs in an area (megawatts of hydropower).
  - Maximum load capacity - capacity required to meet maximum load requirements, including reserve capacity.

G. What technique is to be used for conducting the NA?

- Planning Standards Approach - survey of district engineers.

H. What are the key factors (variables) to be considered in doing the NA?

- Control of water damage.
- Meeting water supply/demand.
- Meeting navigation needs.
- Providing recreational opportunities.
- Providing hydroelectric power to minimize fossil fuel use.

I. With what frequency is the NA to be performed?

- Section 102(a) of the Water Resources Planning Act of 1965 (42 U.S.C. 1962a-1) provides that the Water Resources Council (the Corps is a member agency) shall "...maintain a continuing study and prepare an assessment biennially, or at such less frequent intervals as the Council may determine, of the adequacy of supplies of water necessary to meet the water requirements in each water resource region (of which there are 21) in the United States and the national interest therein...." Two such assessments, which seek to "identify, describe, and place in priority for resolution the Nation's severe existing and emerging problems from both the state-regional and national viewpoints," have been completed.

17. Strengths and weaknesses.

- Partly as a result of general, and often incomplete, agency regulations, the regions and the districts within the same agency are using different detailed steps and assumptions to compute certain benefits. This can cause significantly different benefit-cost ratios. (Source: GAO)
- In his June 6, 1978 national water policy message, President Carter stated that 1) more consistent, uniform, benefit-cost analysis is needed, and 2) independent reviews should be performed to insure that consistent and uniform analyses are actually prepared. By Executive Order, he created a project review function within the Council to insure that impartial reviews would be conducted. As a result of these reviews, greater uniformity will exist in the approach and criteria used by the water-related agencies when they conduct needs assessment; this will increase the comparability and compatibility of each agency's plans. The recommendations resulting from the reviews may enable the reconciliation of conflicts between national priorities and objectives versus regional, state and local goals. Unlike the past when Federal agency planning was project-oriented, concerned with construction of new projects, current trends in planning place greater emphasis on much broader objective; multi-disciplinary and multi-interest planning is now the norm and local participation has increased in the planning process. The mid-course change will likely reduce fragmentation and overlapping responsibilities among Federal and state agencies.

18. Information on Federal funding for the PWI program.

- Projects are authorized which the appropriate Congressional committees consider to be: necessary and economically

justified; engineeringly possible without requiring modifications of the authorized plan beyond the discretionary authority of the Chief of Engineers; generally supported by local interests; and for which there are no anticipated major problems.

- Appropriations may be less than the amounts authorized because of project deauthorization. Section 12 of P.L. 93-251 (the Water Resources Development Act of 1974) requires that Congress be provided a list of unconstructed Corps projects no longer considered appropriate for continued authorization. The criteria for deauthorization is that the project has been authorized for a period of at least eight years and not received appropriations.
- Exhibit A.10, attached, shows appropriations for FY 1967-FY 1978.

19. Primary data sources for completing summary sheet.

- Corps material.
  - Digest of Water Resources Policies, January 1975.
  - Updating Needs Estimates for Civil Works Investment, August 1972.
  - Memorandum for Deputy Under-Secretary of the Army, October 1978.
  - PPB Structure of Civil Works, May 1967.
  - Water Resource Investment Program, January 1978.
  - The Second National Water Assessment, WRC, April 1978.
- GAO Reports.
  - Improvement Needed in Making Benefit Cost Analyses for Federal Water Resources Projects, September 1974.
  - An Overview of Benefit-Cost Analysis for Water Resources Projects, August 1978.
  - Problems Affecting the Usefulness of the National Water Assessment, March 1977.
  - Water Resources Planning, Management, and Development, July 1977.

Exhibit A.10: Army Corps of Engineers Appropriations by Function, 1967-1978 (thousands of dollars)

Fiscal Year	Actual Appropriation	General Investigation	General Construction	Operation and Maintenance	General Expense	Flood Control --- Mississippi River and Tributaries
1967	1,293,000	32,450	965,955	178,900	18,014	87,135
1968	1,305,000	34,445	967,599	193,000	19,515	87,135
1969	1,246,000	30,015	862,714	227,300	21,875	69,600
1970	1,157,000	41,191	711,992	261,825	25,357	80,820
1971	1,310,000	39,024	851,178	301,831	27,586	83,987
1972	1,589,000	50,714	1,025,084	388,519	29,723	86,000
1973	1,952,000	57,805	1,203,943	407,100	32,183	111,620
1974	1,770,000	56,142	873,589	426,625	35,083	264,600
1975	1,757,000	65,284	966,338	494,577	40,100	120,051
1976	2,182,600	66,836	1,237,151	582,073	43,700	205,147
1977	2,492,100	71,920	1,436,745	667,600	49,050	231,497
1978	2,780,300	107,046	1,537,820	768,870	60,000	253,081

Source: Department of the Army, Office of Chief of Engineers, Civil Works Expenditures by State and Year, September, 1977.

Irrigation and Multiple-Purpose Projects
with Power Facilities/Bureau of Reclamation,
Department of the Interior

1. PWI functional areas addressed in this study.

   - Water supply and distribution, as well as civil works: dams and flood control.

2. Conceptual category of need satisfied by this PWI program.

   - Encouragement of economic development (primary).
   - Improvement of quality of life.
   - Protection of property.

3. Type of Federal program.

   - Direct Federal expenditure.

4. Authorizing legislation.

   - Reclamation Act of 1902.
   - Reclamation Project Act of 1939.
   - Flood Control Act of 1944.
   - Fish and Wildlife Coordination Acts of 1946 and 1958.
   - Water Supply Act of 1958.

5. Implementing rules and regulations.

   - Various Reclamation Bureau publications.

6. Program objectives.

   - To provide for Federal development of multipurpose water and land-related resources projects, including such functions as irrigation, municipal and industrial water supplies, hydroelectric power, flood control and river regulation, water quality control, outdoor recreation, and fish and wildlife enhancement in the 17 westernmost contiguous states.

7. Program scope.

   - New construction specifically authorized by Congress.

8. Year program initiated and years when major changes were made.

   - President Theodore Roosevelt signed the Reclamation Act on June 17, 1902. The original purpose of the Reclamation Act was to reclaim land in the arid west, by providing water for municipal and industrial, irrigation and related uses. The

aim was to encourage the settlement of the west; the Reclamation Bureau operates only in the 17 western states. Construction of dams and other irrigation structures was funded by the sale of public lands. Water users were required to liquidate construction costs within 10 years and they were to assume maintenance and operation responsibilities when half of the repayment obligations were met. Private landowners could receive irrigation on a maximum of 160 acres. Unlike the situation for water users, portions of the costs of a Reclamation Bureau project allocated to the purposes of navigation and flood control were paid entirely by the Federal government.

- In 1928, reclamation policy was officially expanded by the Boulder Canyon Act, which embraced the philosophy of multiple-purpose water development. Construction of the Hoover Dam and the All-American Canal involved an integrated program among irrigation, flood control, municipal and industrial water supply, silt abatement, navigation improvement, and hydroelectric generation. Revenues from the sale of electrical energy contributed the largest share of construction repayment.
- The 1939 Reclamation Project Act finally placed the irrigation and settlement program on a sound financial footing. Repayments were varied yearly according to crop production, and no remittances were required during an initial development period of up to ten years. The Act also incorporated multiple purpose objectives into basic reclamation law. Project costs were allocated according to proportionate benefits. These included reimburseable costs -- irrigation, power, municipal and industrial water -- as well as shares for flood control and navigation not returned to the Federal Treasury.
- In 1943, the Reclamation Bureau was reorganized, making it more responsive to the specific requirements of the different western areas. Regional offices were established in the major drainage basins to decentralize investigation, planning, construction, operation and maintenance activities. The Bureau also entered upon a new stage in the evolution of multi-purpose planning, considering an entire river basin development as a single and integrated project. By pooling costs and anticipated revenues (especially power sales), single projects could be justified that were not otherwise feasible.
- The Flood Control Act of 1944 (P.L. 78-534) was landmark legislation in Federal water policy. In that law, Congress dealt with a number of major issues that were to recur: the 160-acre limitation on the use of water from Federal projects as well as Federal construction of transmission lines to move power out of Federal dams. Moreover, this legislation confined the Reclamation Bureau to the 17 western reclamation states.

- The 1946 Fish and Wildlife Coordination Act (P.L. 79-732) permitted allocations of non-reimburseable project costs to fish and wildlife propagation and preservation. This new dimension was strengthened by a 1958 law that placed expenditures for this purpose on equal terms with other resource development functions. The 1965 Federal Water Project Recreation Act (P.L. 89-72) called for giving full consideration to recreation, fish, and wildlife activities in the planning of all future water resource development programs.
- In 1961, the Kennedy Administration made a number of major policy statements which were intended to establish its basic policies on water projects and power. Unlike the Eisenhower Administration which had recommended relatively few new authorizations and new construction starts on Federal water projects with power features, the Kennedy Administration sought a high level of Federal construction activity. Where the Eisenhower Administration had encouraged local public and private interests to build the power features of many Federal water projects, the Kennedy Administration had a strong pro-power building orientation.
- In 1965, President Johnson signed the Water Resources Planning Act (P.L. 89-80). The Water Resources Council, of which the Interior Department was a member, was to assess the adequacy of water supplies in each region and evaluate regional and river basin plans in relation to water needs.
- In 1966, Congress passed the Small Reclamation Projects Act (P.L. 89-553), under which the Bureau could make loans or grants to local groups for construction of small irrigation projects.
- The Federal Water Project Recreation Act of 1973 (P.L. 93-205) provided that recreation, fish and wildlife enhancement be given full consideration when planning any Federal water project. It provided that the Federal construction agency should bear all of the joint costs allocated to recreation and wildlife enhancement and up to half of the separable costs of these items; the non-Federal public body should pay the remaining portion of the separable costs, plus all subsequent operation and maintenance costs.
- After the enactment of the National Environmental Policy Act of 1969, the basic mission of the Reclamation Bureau was expanded beyond the achievement of economic and social objectives through the development of water and related land resources; new planning objectives included balancing economic growth and social well-being while protecting environmental resources.
- The enactment of the Endangered Species Act of 1973 (P.L. 93-205) added muscle to the Federal program protecting fish and wildlife and for the first time authorized protective measures for plants as well. The Act directed all Federal agencies and departments to ensure that their programs did not "jeopardize the continued existence" of endangered or

threatened species," or "result in the destruction or modification of habitat" considered by the Interior Secretary to be critical to an endangered or threatened species.

9. Type of Federal grant or loan mechanism.

   - Direct Federal expenditures except those costs associated with water-oriented recreation, fish, and wildlife functions must be borne by state and local entities.

10. Type of recipient.

   - Public non-Federal entities organized under state law and eligible to contract with the Federal government. Public non-Federal and private entities are eligible to contract with the Federal government for power. The Bureau's activities are generally confined to the 17 contiguous western-most states.

11. Eligibility and application requirements for state and/or locality to receive Federal funds.

   - Before undertaking a feasibility investigation, authority and appropriation of necessary funds must be obtained from Congress. After obtaining such authority and funding, the Secretary of the Interior develops a feasibility report describing the engineering feasibility, economic justification of the project, and the ability of the project beneficiaries to repay the reimburseable costs of certain functions within an authorized time. Congress then either approves or disapproves the Reclamation Bureau's project. Grassroots cooperation is particularly necessary because of the ability for reimbursement requirement of the Reclamation law.

12. Federal funds allotment procedure and matching requirements.

   - A significant feature of the Reclamation Program is the economic analysis that accompanies any proposed project. This evaluation consists of: 1) plan formula studies to determine the optimum size and mix of functions; 2) benefit-cost analysis aimed at the question of economic justification for the project; 3) cost allocation studies to assign costs to the various reimburseable and non-reimburseable functions; and 4) repayment analysis. Individual projects are subjected to Congressional hearings, authorization, and funding.

13. Factors used in determining the Federal allotment.

   - Even though zero-based budgeting is relatively new in its application government-wide, it has always been used in the Reclamation Bureau. Overall, the Bureau seeks to maintain

and operate current existing projects, and keep authorized construction ongoing in order to meet Congressionally approved schedules and to minimize the impacts of inflation due to schedule slippage. Consequently, new construction investigations and/or new construction start-ups are relatively low-priorities despite the relative high benefit-cost ratios.

- The Reclamation Bureau has used the Principles and Information developed by the Water Resources Council since 1968. In keeping with those principles and that data base, the Bureau has developed a 12-point indexation schedule which allows various projects to be compared vis-a-vis their total score. A general description of the indices used for priority ranking follows.[1] It must be remembered that the traditional activity of the Bureau has been irrigation, providing full water supply to new arid lands and supplemental water for irrigated areas having inadequate supply; presently, the output of Reclamation projects includes not only agricultural water, but also municipal and industrial water, hydroelectric power, recreational opportunities, and flood control.

14. Agency or Congressional rationale for using this procedure and variables.

- As has been detailed in the answer to this question in the summarizing of the Army Corps of Engineers, the Flood Control Act of 1936 declares that the benefits of Federal projects should exceed costs. This Act (33 U.S.C. 701 B) has led to the development of analytical procedures for evaluating the benefits and costs of proposed water resource, and related land resource projects.

15. Degree to which states and localities influence project selection.

- The Bureau's program is mostly scheduled and initiated by the Federal government with local endorsement. The Bureau cooperates with all interested and concerned Federal, state and local agencies, and especially with local water users.

16. Information on needs assessment (NA) required by Federal PWI program legislation or agency rules and regulations.

A. Clarity of needs assessment requirements in the authorizing laws; in the rules and regulations.

- Very clearly stated in the Law and its amendments.

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[1] See Exhibit A.11, attached.

B. Is NA a precondition for grant, loan or direct Federal expenditure?

- Yes.

C. Does program provide additional grants-in-aid for conducting the NA?

- Yes. The Interior Department's operating budget provides for a planning staff.

D. Who conducts the NA?

- The field team of the Reclamation Bureau.

E. In what type of document is the NA contained?

- Project application submitted to Congress.

F. How is need defined?

- Contribution to long-term water needs.
- Employment benefits.
- Effects on water quality.
- Significance of recreational opportunity.
- Importance to the local community.

G. What technique is to be used for conducting the NA, i.e., measuring the need?

- Both planning standards and expert opinion.

H. What are the key factors (variables) to be considered in doing the NA?

- Conservation of land and water.
- Hydroelectric power.
- Flood control.
- Navigation.
- Water quantity and quality (salinity).
- Propagation of fish and wildlife.

I. With what frequency is the NA to be performed?

- Benefit-cost analyses must be updated in order to reflect changes in the interest rate, as well as the net effects of local changes.

17. Strengths and weaknesses.

- Presumably, the benefit-cost analyses developed and reported to the Congress by the Federal water resource construction agencies (Reclamation Bureau, Corps of Engineers, Soil Conservation Service, and Tennessee Valley Authority) provide similar information about the economic feasibility of proposed projects. One of the reasons for this presumption is that these agencies' analyses are supposed to conform to the evaluation and formulation guidelines which detail how the ratio is to be developed. However, the Bureau interprets and applies the procedures in ways different from the other agencies, thereby making their benefit-cost ratio incomparable to other agencies. (Source: GAO)

18. Information on Federal funding level for PWI program.

- Generally, Bureau projects are authorized with flexible authorization ceilings which increase with inflation. The ceiling applies to very small projects, as well as those costing several hundred million dollars. Congress is to be informed of increases in these costs caused by inflation, as well as cost increases due to changes in project scope. The authorization ceiling limits the expenditure of Federal funds and forces the Bureau to consider various funding alternatives, including the possibility of cost-sharing with beneficiaries.
- President Carter's goal is to achieve a balanced budget in 1981. This means that some present construction schedules will be streched out, and few speeded up. The Bureau several years ago had a large backlog of authorized but unfunded projects; the total amounts to over $6 billion.
- Due to changing western needs, like rapid urban expansion, more projects have been built that supply cities with domestic and industrial water. Emphasis on irrigation has changed from new canal development to providing supplemental water to existing fields. Similarly, greater emphasis has been placed on flood control, recreation, and fish and wildlife habitat. Exhibit A.12, attached, shows the record of where Reclamation funds have been spent.

19. Primary data sources for completing summary sheet.

- Reclamation Bureau information.
  - Volumes I through IV of Federal Reclamation Projects: Water and Land Resource Accomplishments, September 1977.
  - Planning Activities: A Description of Formulation of Reclamation Planning Reports, December 1968.
  - Program Strategy for Fiscal Year 1979, May 1977.
  - Memorandum from Commissioner of Reclamation on Ranking Construction Starts in Fiscal Year 1973, May 1971.
  - The Federal Reclamation Program, December 1972.

- Congress and the Nation, Volumes I through IV.
- GAO Publications.
  - Improving Project Authorizations and Agency Practices, July 1978.
  - Improvements Needed in Making Benefit-Cost Analyses, September 1974.
  - Improvements Still Needed in Making Benefit-Cost Analyses, August 1978.

Exhibit A.11: General Description of Indices for Priority Ranking System

1. Regional Water Needs Index.

   The major river basins have been assigned various weights which are intended to reflect their relative needs for water. The priority rating for each project is determined by the basin in which it is located.

2. Relative Effectiveness in Meeting Water Needs Within Region.

   Projects were assigned priorities on the basis of the magnitude of their contribution to the total long-term water needs within the region. Such factors as project scale and purposes served are related to regional water needs in determining whether the project would be relatively high, medium, or low in effectiveness.

3. Regional Stability or Growth.

   The purpose of this index is to give priority to projects in areas where population is declining, the local economy has stagnated, or which suffer from chronic unemployment, or underemployment. A weight of five is assigned for each of the following conditions: 1) if the population decreased during the period 1960 to 1970 in the state(s) where the project is located; 2) if the project county population decreased during the period 1960 to 1979; and 3) if area redevelopment benefits are claimed due to the project's proximity to an area qualifying under the Public Works and Economic Development Act of 1965, P.L. 89-136 (EDA qualifying).

4. Effects on Regional Water Quality.

   Priorities are assigned on the basis of the anticipated effects of project operation on regional water quality. A weight of negative five is assigned if the project would result in net degradation, zero for no significant effect, and five for quality enhancement.

5. Effectiveness in Meeting Urban Recreational Needs.

   Priorities for recreational use of project facilities are assigned on the basis of an assumed high degree of correlation between urban visitation and the proximity of the reservoir to population centers. In general, if the project provides recreational opportunities and the recreational areas are within 40 miles of a standard metropolitan statistical area (SMSA) of 250,000 people or greater, the project is considered to afford a significant urban recreational opportunity.

   If the distance exceeds 40 miles, but recreation benefits are anticipated, the effectiveness in meeting urban recreational needs is considered nominal. No significant impact would occur if recreational visitation is negligible.

Exhibit A.11: General Description of Indices for Priority Ranking System (continued)

6. Social Considerations.

This index is intended to reflect the social merit of a project. Social benefits are assumed to accrue primarily to people who would live in the project service areas and social costs to those who would be dislocated from the reservoir or rights-of-way areas. Weights are assigned on the basis of a ratio of the number of people whose social environment would be significantly enhanced as compared to those whose social environment would be significantly degraded. Numerical limits have not been established for the ratio. The ratio is defined as high, moderate, or low in a general, relative sense.

7. Alternative to Federal Construction (or Investigation).[1]

Priorities are assigned according to the need for Federal initiative. Projects which can be constructed only through Federal initiative are assigned higher priorities as compared to those which can be constructed by other entities or where there are reasonable alternative methods of accomplishing the project's objectives. A weight of ten is assigned if there are no practical alternatives to Federal construction. If state or local interests are considered capable of developing the project in a manner which would achieve most of the project objectives, a weight of five is assigned. No weight is assigned if there are reasonable alternative methods of accomplishing the primary project objectives (e.g., if agricultural production requirements could be efficiently met by means other than irrigation).

8. Adverse Effects of Non-Federal Alternative on Costs or Benefits.

Projects constructed by non-Federal entities may create certain adverse effects if, for example, they represent special interests or are limited in scale of development due to capital restrictions or other considerations. This index gives priority to those projects where Federal construction would better represent the public interest and avoid these adverse effects.

9. Urgency for Federal Construction (or Investigation).

The consequences of construction delays are considered in assigning priorities for this index. Such factors as losses in benefits, and inflation, hardships to project beneficiaries, and irreversible processes which may be underway such as damage to an aquifer are considered.

[1] In the rankings for the investigation starts, the alternative to Federal investigation are considered. Weights are assigned using the same criteria as for the construction alternatives.

Exhibit A.11: General Description of Indices for Priority Ranking System (continued)

10. M&I Water and Irrigation Rescue Factor.

Projects which provide municipal and industrial water and/or supplement the water supply on existing irrigation projects are given higher priority than those serving new lands or other project purposes requiring water deliveries. The ratio of M&I plus supplemental irrigation water deliveries to total water deliveries on an annual basis is multiplied by ten to obtain the weights for each project.

11. M&I and Irrigation Cost Repaid by Water Users.

Priority is given to projects where the water users pay the highest proportion of allocated costs. The ratio of those M&I and irrigation costs which are repaid by M&I and irrigation water users to the total costs allocated to M&I and irrigation is multiplied by ten to obtain the weights for each project.

12. Benefit-Cost Ratio.

Priorities are assigned to the various projects according to their respective ratios of measurable benefits to costs. The quotient, less one, of benefits divided by costs is multiplied by ten to obtain the weights for each project. Weights for this index are limited to maximums of 15 points for the direct benefit-cost ratio and 20 points for the total benefit-cost ratio (an alternate).

The interest rates used in the respective benefit-cost analyses are presented beneath the weights assigned to each project. In general, for comparative purposes, the benefit-cost ratios based on the lower interest rates are overstated in relation to those based on higher interest rates. Adjustments in priorities are made in those instances where discrepancies in interest rates are sufficient to influence the rankings. General curves relating changes in interest rates to changes in benefit-cost ratios are used to determine whether discrepancies in interest rates are significant.

Total Score:

The total score represents the arithmetic sum of the priority weights assigned to each project by the various indices.

Priority Ranking.

Ordinal numbers are assigned each project according to attained total score.

Exhibit A.12: Estimated State Distribution of Annual Funds Available, Fiscal Years 1903-1977

(THOUSANDS OF DOLLARS - # DENOTES UNDER $500)
(Includes Fiscal Year 1978 Appropriation Act and Supplemental Act, Undistributed)

FISCAL YEAR	TOTAL	ALASKA	ARIZONA	CALIF 1/	COLORADO 1/	D. C. 1/	HAWAII	IDAHO 1/	IOWA	KANSAS	MINN	MISSOURI ARKANSAS	MONTANA 1/
2/	0	0	9,561	34	5,474	0	0	435	0	#	0	0	230
1903	6,119	0	2,854	94	39	15	0	27	0	40	0	0	49
1904	16,890	0	3,000	0	2,500	0	0	2,600	0	0	0	0	1,200
1905	4,750	0	0	0	0	0	0	1,300	0	0	0	0	1,900
1906	9,479	0	1,739	0	0	0	0	1,300-	0	240	0	0	1,200
1907	4,421-	0	3,086-	1,785	355	35	0	678	0	40-	0	0	1,386-
1908	8,955	0	1,672	505	500	38	0	748	0	75	0	0	737
1909	9,754	0	2,446	1,222	750	0	0	1,099	0	50	0	0	845
1910	9,368	0	1,705	265	540	0	0	2,208	0	34	0	0	661
1911	27,267	0	2,203	640	2,800	93	0	3,488	0	0	0	0	1,777
1912	8,766	0	1,100	70	400	2,307	0	2,090	0	0	0	0	693
1913	7,236	0	385	71	250	965	0	2,371	0	0	0	0	1,230
1914	17,536	0	3,514	621	1,134	2,778	0	2,920	0	8	0	0	2,666
1915	699	0	1,420	25	171-	3,296-	0	379	0	31-	0	0	3,147
1916	15,830	0	1,355	241	1,170	0	0	2,002	0	2	0	0	2,367
1917	9,780	0	396	743	597	0	0	849	0	2	0	0	1,982
1918	3,438	0	375	548	590	0	0	843	0	1	0	0	1,555
1919	10,425	0	829	700	642	#	0	1,660	0	0	0	0	1,124
1920	9,585	0	122	751	398	#	0	1,466	0	0	0	0	1,077
1921	9,452	0	174	714	382	0	0	1,443	0	0	0	0	1,102
1922	29,863	0	170	424	591	0	0	3,608	0	0	0	0	2,432
1923	15,620	0	255	0	492	0	0	2,121	0	0	0	0	1,349
1924	10,636	0	233	368	598	1	0	2,102	0	0	0	0	3,413-
1925	11,776	0	522	895	812	0	0	2,137	0	0	0	0	446
1926	13,063	0	12	1,154	424	0	0	1,326	0	0	0	0	1,963
1927	7,311	0	100	1,022	278	3	0	2,415	0	0	0	0	259
1928	12,279	0	61	1,142	252	186	0	1,874	0	0	0	0	1,211
1929	14,443	0	164	620	139	181	0	2,162	0	0	0	0	1,391
1930	19,405	0	5,555	750	44	188	0	1,074	0	0	0	0	754
1931	4,583	0	41	880	120	198	0	2,613	0	0	0	0	329
1932	22,273	0	7,520	797	45-	180	0	544	0	0	0	0	475
1933	25,477	0	11,520	185	0	111	0	367	0	0	0	0	131
1934	114,491	0	29,411	5,456	2,789	147	0	3,511	0	0	0	0	2,879
1935	40,253	0	3,850-	3,097	882	108	0	130	0	0	0	0	260
1936	37,771	0	4,918	23,291	808	409	25	508-	0	0	0	0	246
1937	42,627	0	6,891	1,401	1,853	207	25	1,627	0	7	0	0	373
1938	81,640	0	5,878	20,063	4,853	505	0	1,784	0	0	0	0	2,245
1939	46,464	0	2,653	14,117	2,311	353	0	2,092	0	0	0	0#	366
1940	84,394	0	4,191	21,536	4,916	487	0	789	0	64	0	0	1,242
1941	80,506	0	3,225	34,870	4,424	385	0	1,152	0	35	0	0	614
1942	104,123	0	11,476	45,526	4,791	634	0	5,439	0	92	0	0	243
1943	94,712	0	8,992	49,579	4,839	693	0	4,889	0	68	0	0	233
1944	47,482	0	2,004	28,735	1,000	621	0	3,365	0	31	0	0	449
1945	42,018	0	1,771	15,498	3,667	788	0	5,118	0	98	0	0	1,197
1946	123,691	0	3,951	37,119	9,627	2,504	0	10,004	0	589	0	0	5,944
1947	124,448	0	11,479	24,727	11,920	2,181	0	7,590	0	804	0	0	4,263
1948	149,058	0	34,312	18,153	1,614	2,184	0	8,706	0	823	0	0	7,972
1949	271,624	151	25,385	56,463	28,081	2,177	0	10,122	0	2,458	0	0	22,467
1950	367,198	200	46,910	85,646	30,434	2,219	0	4,210	0	7,510	0	0	36,585
1951	277,776	1,300	19,327	50,529	29,504	2,268	0	1,550	0	9,052	0	0	34,317
1952	241,452	5,951	20,076	58,212	22,799	2,188	0	4,086	200	4,830	0	0	34,844
1953	230,861	13,250	10,968	47,009	20,228	2,130	0	10,424	450	5,387	0	1/ 50	22,502
1954	148,416	7,481	8,598	24,430	5,725	1,921	0	19,707	1,100	11,079	0	0	9,590
1955	167,955	2,407	9,056	47,327	4,524	1,652	0	16,726	500	8,402	1,000	0	7,241
1956	185,280	114	8,905	39,909	6,339	1,628	50	13,870	452	9,932	1,150	0	14,405
1957	201,996	776	18,201	63,928	5,794	1,735	10	13,429	300	4,496	2,165	0	2,569
1958	207,871	516	13,889	69,976	6,305	1,879	0	14,284	500	8,175	2,400	0	10,549
1959	273,488	505	55,080	71,110	9,103	1,994	0	4,862	0	2,082	1,550	0	10,895
1960	264,267	522	53,017	70,309	12,266	2,113	13-	4,668	680	5,155	2,175	0	8,666
1961	290,131	552	32,578	79,377	19,619	2,261	0	3,957	2,210	3,267	600	0	10,944
1962	282,478	444	26,003	78,605	26,549	2,404	12-	4,544	4,995	8,703	885	0	20,496
1963	352,276	648	41,527	73,390	35,327	2,605	3,225	4,967	1,600	14,347	483	100	24,249
1964	365,890	1,262	49,994	71,748	49,194	2,860	1,282	3,665	405	13,648	390	100	30,601
1965	342,538	2,204	38,526	78,392	38,841	3,004	0	2,228	2,556	12,245	396	1/ 240	29,585
1966	351,354	1,681	39,472	108,488	45,864	3,272	1,290-	4,756	671	16,246	269	0	17,345
1967	353,927	821	37,592	120,682	60,180	3,402	0	4,823	478	14,163	118	0	10,367
1968	347,294	877	40,464	94,025	49,810	3,428	823	4,555	818	12,528	148	0	10,249
1969	311,917	0	32,417	78,342	36,463	3,717	268	4,040	1,663	5,279	192	11	9,783
1970	309,016	0	39,188	76,620	32,704	3,894	199	5,067	525	2,320	631	11	6,860
1971	357,592	0	36,086	86,944	37,365	4,783	1-	5,429	535	1,511	1,127	12	9,198
1972	441,565	0	62,901	100,733	41,081	4,734	0	6,918	765	1,375	1,005	13	9,221
1973	565,648	0	94,873	137,452	52,521	5,063	0	18,615	297	2,024	246	11	11,190
1974	483,219	0	99,576	83,096	65,507	5,235	0	20,431	623	1,362	672	15	10,983
1975	575,269	0	128,057	100,237	62,554	6,301	0	23,032	1,213	2,525	898	3	14,867
1976	726,780	0	133,344	154,355	78,968	6,881	0	24,601	6,734	3,013	1,181	4	19,543
1977	905,436	0	26,391	44,821	20,720	1,660	0	203,717	2,906	999	347	1	4,892
1977	1,220,406	5	219,265	211,805	95,760	7,790	0	215,878	3,995	3,380	1,415	5	21,877
*1978	769,425	0	22,675	0	0	0	0	0	0	0	0	0	0
TOTAL	13,259,649	41,862	1,714,121	2,863,902	1,154,490	112,165	4,589	783,627	37,171	194,706	21,423	596	543,275 *

1977-P
1978-P
1979-P

Note.--Distribution based on location of features, not on location of beneficiaries; e.g., Wyoming dams providing water for Idaho land are costed in Wyoming for this tabulation.

P - Program in Budget Justifications for FY 1979 Appropriation. Program Data includes prior year funds, non-Federal advances, and underfinancing (excludes appropriated interest). Funds available do not include these items.

Each estimate is rounded independently, without adjustment to totals. Includes funds for CCC--Job Corps.

* Appropriation Acts partially distributed. UCRBF shown under "Agency."

Exhibit A.12: Estimated State Distribution of Annual Funds Available, Fiscal Years 1903-1977 (continued)

THOUSANDS OF DOLLARS - # DENOTES UNDER $500)
(Includes Fiscal Year 1978 Appropriation Act and Supplemental Act, Undistributed)*

FIS YEAR	NEBRASKA	NEVADA 1/	NEW MEXICO	NORTH DAKOTA	OKLAHOMA	OREGON	SOUTH DAKOTA	TEXAS 1/	UTAH 1/	WASHINGTON	WYOMING	UNDISTRIBUTED 2/ AGENCY RESERVE	TOTAL
3/	0	90	4,087	25	0	122	50	0	11,331	338	1,906	3/30,586	2/2,798 -
1903	40	2,741	27	33	33	33	25	0	36	36	33	0	4,115
1904	0	0	240	0	0	2,000	2,100	0	0	0	3,250	0	14,590
1905	0	0	0	550	0	1,000	0	0	0	0	0	0	4,750
1906	0	300	800	450	0	0	0	0	1,250	2,950	2,330	0	9,979
1907	743	793	1,150	192	32	832-	753-	0	816	1,374	1,184	0	12 - 4,215
1908	100	140	1,059	47	5	304	628	0	191	1,206	989	0	11 8,955
1909	100-	56	83	212	0	238	350	0	200	811	1,267	0	125 9,754
1910	0	80	56	60	0	344	320	0	320	1,620	1,286	0	116 - 9,368
1911	0	2,018	4,500	50	0	1,130	440	120	2,271	2,083	3,706	0	0 27,367
1912	500	10	945	150	0	160	150	0	0	330	255	0	0 8,766
1913	0	0	10	180	0	60	105	0	0	0	472	437	0 0 7,236
1914	285	105	377	35	100	1,477	343	10	84	1,478	278 -	0	23 - 17,330
1915	254	24	234	16	43-	1,223-	62	148	245-	593	560-	0	8 - 699
1916	0	234	849	25	51	691	144	501	432	1,302	2,213	0	1 - 13,830
1917	1	220	617	50	51	415	113	365	315	856	1,227	0	0 - 9,740
1918	1,044	795	477	54	101	397	281	301	176	1,157	394	0	310 - 9,438
1919	2	604	736	0	1	447	262	636	66	809	1,470	0	343 10,425
1920	570	359	835	85	0	113	141	517	61	687	853	0	4/ 544 8,585
1921	710	618	1,196	194	0	72	120	414	108	1,031	901	0	441 9,452
1922	1,759	1,484	1,503	175	0	2,590	445	500	149	2,149	3,004	0	336 20,443
1923	1,242	824	781	106	0	1,631	315	307	104	1,691	2,169	0	285 15,620
1924	1,223	662	694	195	0	2,944	88	356	452	1,650	2,632	0	314 16,434
1925	320	486	484	94	1	1,612	192	350	93	951	3,001	0	0 11,776
1926	439	667	725	25	0	1,490	45	0	942	2,770	1,814	0	0 13,063
1927	1,000	140	435	4	0	520	46	153	40	390	698	0	0 7,511
1928	2	234	850	0	0	3,377	130	200	0	2,389	495	0	90 12,279
1929	0	0	859	0	0	3,313	260	330	1,760	2,310	738	0	197 14,443
1930	4	5,230	305	0	0	1,741	336	22	8	2,444	864	0	88 19,405
1931	30	0	188	0	0	2,134	154	375	314	1,950	477	0	24 9,583
1932	0	7,500	547	0	0	3,163	151	0	7	1,301	197	0	35 22,373
1933	0	11,500	81	0	0	642	1	300	1	830	170	0	4 25,477
1934	0	25,014	805	0	0	7,602	1	0	8,451	15,720	13,042	0	35 - 114,941
1935	50	0	100	0	0	627	1	5,305	75	23,278	10,191	0	2 - 40,253
1936	20 -	4,215	3,940	0	0	682	1	1	1,110	7,040	1,290	0	67 - 37,771
1937	5 -	3,400	740	0	30	989	1	340	440	21,774	2,028	0	616 42,827
1938	0	1,500	1,857	5	38	877	130	5,000	4,126	28,795	3,663	0	142 81,640
1939	40	1,585	2,569	33	45	752	1	5,325	540	13,290	1,753	0	740 40,444
1940	1,161	3,389	1,931	711	1,014	916	989	5,137	1,449	31,198	1,896	0	1,327 86,194
1941	88	3,253	1,313	328	21	722	521	5,575	1,456	20,298	3,007	0	1,446 60,306
1942	94	4,929	1,513	9	864	1,611	6	2,349	1,736	17,987	1,570	0	3,212 104,123
1943	11	3,232	906	83	1,026	604	177	0	1,204	30,397	1,352	0	0 41,992
1944	75	1,401	712	11	1,672	570	569	130	1,023	2,190	704	0	826 47,482
1945	1,665	244	3,292	135	1,160	2,660	62	699	540	4,334	614	0	2,691 - 42,014
1946	1,212	1,214	5,167	1,974	3,194	2,344	2,527	391	4,009	19,583	7,657	2,621	1,414 - 111,961
1947	1,752	1,426	2,950	384	2,406	4,142	331	907	3,064	22,199	12,636	8,617	1,869 1 124,448
1948	2,419	2,344	1,954	22	2	2,354	3,889	532	1,784	32,770	9,082	1,581	259 - 149,058
1949	12,426	6,224	2,182	1,152	408	7,173	4,933	4,945	2,124	15,757	22,124	4,733	7 - 211,984
1950	15,572	5,175	2,076	7,750	402	3,390	8,607	867	5,522	71,268	26,370	5,517	1,030 - 367,198
1951	15,456	5,522	3,969	10,721	402	2,296	7,677	868	5,721	47,414	20,996	7,000	143 - 277,776
1952	10,054	3,654	4,459	4,775	277	2,111	9,801	729	3,645	30,461	13,379	5,000	44 - 241,452
1953	5,258	2,585	4,930	1,139	2	1,416	4,293	4	4,305	25,796	7,763	5,000	104 - 230,481
1954	4,477	2,884	4,437	2,659	214	963	7,517	504	4,823	24,214	8,271	2,500	224 - 146,416
1955	6,918	3,451	4,449	4,456	154	1,362	6,962	556	8,335	19,318	7,911	2,240	904 - 167,955
1956	9,055	2,420	11,153	3,578	1,705	1,703	1,823	904	10,354	20,442	12,620	2,700	117 - 185,280
1957	7,380	3,736	6,111	2,082	630	3,318	1,990	1,325	11,219	24,294	16,040	2,700	3,806 - 201,996
1958	4,798	2,462	6,502	3,170	3,566	6,693	4,101	1,449	15,935	20,233	15,835	3,600	207,481
1959	6,125	3,659	12,223	5,251	8,134	11,970	5,926	6,723	22,131	16,943	14,792	2,238	12 - 273,448
1960	6,717	5,316	12,554	6,146	8,519	6,305	3,804	6,724	22,024	13,927	10,126	2,625	351 - 264,267
1961	16,753	4,645	15,749	12,054	7,147	5,431	6,447	17,757	21,672	13,640	7,460	2,417	167 - 290,131
1962	12,670	2,295	7,453	4,769	2,980	3,674	5,822	18,103	17,678	13,484	9,195	5,434	1,495 - 282,474
1963	12,236	3,455	9,947	3,070	4,993	5,442	7,094	18,347	10,915	13,381	12,841	2,120	1,712 - 352,276
1964	15,038	3,515	7,616	1,789	8,131	4,328	12,994	23,352	23,306	15,760	16,761	7,133	1,637 - 365,450
1965	15,630	5,994	11,131	1,204	5,682	5,730	4,959	20,478	31,115	14,091	17,953	11,233	342,538
1966	8,306	4,228	6,433	1,966	4,962	3,050	3,659	22,569	12,948	9,445	8,962	7,953	618 - 351,334
1967	2,813	6,591	10,917	4,450	1,384	3,986	4,809	10,272	13,734	22,961	9,129	7,270	1,003 - 353,927
1968	3,958	14,707	17,534	3,661	329	4,376	4,341	2,193	12,825	23,882	8,062	6,296	1,944 - 349,496
1969	8,259	23,445	12,169	8,918	505	1,634	6,408	2,549	13,428	51,696	6,912	5,062	3,814 - 311,917
1970	6,258	21,185	10,146	12,436	278	2,035	6,554	3,010	13,660	44,026	8,213	5,273	1,915 - 309,216
1971	2,650	23,651	13,184	10,381	1,105	3,117	5,427	3,400	14,465	78,051	8,901	4,326	489 - 357,592
1972	2,495	7,295	15,230	14,572	3,392	8,524	6,417	5,444	22,804	114,339	8,797	4,359	445 - 441,565
1973	3,063	5,282	15,945	24,683	6,757	12,438	7,080	12,262	36,941	47,828	9,526	907	131 - 455,944
1974	4,275	6,623	23,548	17,875	6,898	10,597	6,198	12,244	14,339	92,240	9,240	1,159 -	56 - 483,019
1975	5,473	9,277	25,049	18,445	8,425	10,435	13,470	12,125	17,703	112,453	9,261	180 -	978 - 575,269
1976	8,750	10,167	31,518	18,251	8,534	9,278	27,614	13,195	24,091	133,166	12,197	0	954 - 726,780
1977	2,167	2,305	8,442	4,333	1,447	3,344	12,560	5,226	14,334	36,378	2,414	0	2,539 - 405,436
1977	10,931	13,634	31,709	23,741	6,208	13,441	33,060	26,048	48,221	118,915	13,352	1 -	78,081 1,204,904
*1978	0	0	0	0	0	400	0	0	0	0	0	0	71,941 874,409
TO-TAL	269,446	316,454	438,374	264,209	116,310	218,119	297,804	287,152	525,554	1,700,631	454,272	140,736	766,391	13,259,944

1977-P
1978-P
1979-P

1/ Includes direct administrative allotments for Commissioner's Office, Engineering Center and Regional Directors' Offices.

2/ Undistributed allotments include participating agencies under the Pick-Sloan and Upper Colorado River Basin Programs and reserves distributed in subsequent years, except: Drought Emergency Assistance, unallotted..... $ 36,221.2
Emergency Fund unallotted..... 5,928.9
Commissioner's reserve unallotted..... 93.8
Loan Program, Small Project, reserve..... 2,161.0
Refunds and Returns Treasurer authorization unallotted 3.2
Funds transferred to other agencies 47,597.3
Subtotal..... 91,982.9
Fiscal Year 1978 Appropriation Act
Appropriations..... 574,409.0 G.224
Total..... Rec.391.9

3/ Funds allotted to other agencies for Recreational and Fish and Wildlife Facilities (Section 8) during fiscal years 1962 to 1973 have been distributed to specific projects. Bureau funds are shown in appropriate year.

4/ Distribution of compensation increase 1918 through 1924, not available by fiscal year except in total.

5/ Includes Red River investigations, amounts:
1951, $50,000
1965, $10,000

Appropriation acts partially distributed. UCRBP shown under "Agency."

ADDENDUM B: 1975 ACIR SURVEY OF FEDERAL ADMINISTRATORS OF GRANT PROGRAMS

B.1 Background

In reviewing the needs assessment methodologies of the 17 Federal public works investment (PWI) programs surveyed in this task, the degree to which Federal, state and local officials interact with one another in selecting projects for receipt of Federal funds was examined. It was recognized by the Department of Commerce and explicitly stated as an area of concern in the Statement of Work.

Therefore, to obtain insights into the degree to which such interaction takes place, as well as the extent to which state and local officials influence the determination of need (i.e., project selection), CONSAD reviewed, compiled and analyzed raw survey results obtained by the Advisory Commission on Intergovernmental Relations (ACIR) as part of their study, in the Spring of 1975, to ascertain how the intergovernmental grant system is viewed by Federal, state and local officials.[1]

The Advisory Commission on Intergovernmental Relations (ACIR) was created as a permanent agency in 1959 pursuant to PL 86-380. As part of its duties, the ACIR studies particular problems that impede the effectiveness of the Federal system. The intergovernmental grant system was identified as such a problem by the ACIR in the Spring of 1974. In order to evaluate the functioning of that system, the ACIR felt it was essential to determine the perceptions of those who are responsible for its day-to-day operation, i.e., officials at the Federal, state and local levels.

To this end, four surveys were conducted: 1) a survey of city and county executives; 2) a survey of state budget officers; 3) a survey of state administrators; and 4) a survey of Federal administrators of grant programs.[2] For the purposes of the current PWI study, the last survey was deemed of primary interest because it was the only survey where it was possible to obtain the raw survey responses from the ACIR for those Federal grant programs that were PWI in nature. The other survey results pertained to all Federal grant programs (or state grant programs) and could not be used to draw conclusions about Federal PWI grant programs.

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[1] Raw data had to be reviewed in order to get information for PWI programs only. The ACIR survey results did not look at PWI programs specifically.

[2] ACIR, The Intergovernmental Grant System as Seen by Local, State and Federal Officials (A-54), March 1977.

Pertinent survey results for the Federal PWI grant programs are described in the following subsections. It is important to keep in mind, however, that this material is five years old, and conditions may have changed in the interim.

B.2 Federal PWI Programs

For this survey, the ACIR mailed a total of 440 questionnaires to Federal administrators of grant programs; 276 valid responses were received. CONSAD contacted the ACIR and obtained the raw survey results for these programs. The scope and purpose of each of these responses (each pertaining to an individual) were reviewed and 45 responses (programs) were identified by CONSAD as being related to PWI. Exhibits B.1 and B.2 provide a breakdown of these 45 programs by PWI functional area and by Federal agency, respectively.

As is indicated, almost all PWI functional areas are represented by at least one program. Moreover, many of the programs are labelled "economic development," which cuts across many PWI functional areas. Also, many programs are PWI planning assistance type programs.

A variety of Federal agencies are represented by the 45 programs. Approximately one-fourth of the programs are associated with the various regional commissions (Appalachian Regional Commission, Four Corners Regional Commission, New England Regional Commission, Upper Great Lakes Regional Commission, Old West Regional Commission, and Pacific Northwest Regional Commission). The only agency not represented here, that is represented among the 17 Federal PWI programs examined earlier in this task, is the Army Corps of Engineers. Since the Corps primarily engages in PWI activities directly, this questionnaire would not be applicable to them.

In sum, the 45 programs represented here provide a good cross section of both PWI functional areas and Federal agencies that administer PWI programs. Almost all are categorical grant programs and three-fourths are project grant programs.

B.3 Survey Results for All Federal PWI Programs

Having identified the responses that were related to Federal PWI programs, CONSAD then tabulated the raw responses for those questions most relevant to the PWI study; i.e., those specifically related to Federal, state and local government interaction vis-a-vis disbursement

Exhibit B.1: Federal PWI Program Responses by PWI Functional Area

PWI Functional Area	Number and Percent of Responses	
Transportation		
Highways, Bridges, Streets	3	6.7
Railroads	0	0
Mass Transit	1	2.2
Harbor Facilities, Ports	0	0
Airports	1	2.2
Sewer Lines/Treatment Plants	1	2.2
Water Supply and Distribution	1	2.2
Civil Works: Dams, Flood Control, Conservation	5	11.1
Education		
Elementary/Secondary	2	4.4
Higher Education	1	2.2
Vocational Education	1	2.2
Hospitals and Other Health Facilities	3	6.7
Public Buildings	1	2.2
Public Safety: Prisons, Police, Fire Protection	1	2.2
Economic Development	9	20.0
Disaster Assistance	1	2.2
Air Pollution	1	2.2
PWI Planning Assistance Programs	13	28.9
Total	45	100.0

Exhibit B.2: Federal PWI Program Responses by Federal Agency

Federal Agency	Number and Percent of Responses	
Department of Agriculture		
Farmers Home Administration	2	4.4
Soil Conservation Service	2	4.4
Forest Service	1	2.2
Department of Commerce		
Economic Development Administration	5	11.1
Department of Health Education and Welfare		
Public Health Service	1	2.2
Office of Education	6	13.3
Department of Housing and Urban Development		
Community Planning and Development	1	2.2
Federal Disaster Assistance Administration	2	4.4
Department of the Interior		
Bureau of Outdoor Recreation	1	2.2
Bureau of Reclamation	1	2.2
Regional Commissions	12	26.7
Department of Justice		
Law Enforcement Assistance Administration	2	4.4
Department of Transportation		
Federal Aviation Administration	2	4.4
Federal Highway Administration	1	2.2
Urban Mass Transit Administration	1	2.2
Environmental Protection Agency	2	4.4
Veterans Administration	3	6.7
Total	45	100.0

of Federal PWI funds, as well as those related to other topics covered in the Addendum A project summaries (e.g., appropriations, authorizations, grant formulae, etc.). These detailed results are contained at the end of Addendum B (see Section B.5). The reader will note that some questions have been omitted; these primarily relate to the administration of the grant programs and are not of particular interest here.

B.3.1 Part I Results

One indicator of a state or local recipient's performance under the grant system (and an indicator of whether or not a Federal program is operating as intended) is the Federal grantor's experience in threatening or actually withholding government funds or the suspension of payments because recipients have not adhered to program guidelines. Within the five years 1970-1975, the withholding of funds was threatened in 42 percent of the programs, and in 40 percent of the programs payments actually were withheld or suspended.

Another indicator of the ability of a program to achieve its Congressional mandate is the frequency of impoundment of program appropriations. During the period 1965-1975, 38 percent of the programs had funds impounded, ranging from 1 percent to 50 percent of total program appropriations over the ten year period. In almost 28 percent of the programs having funds impounded, the respondent felt that achievement of the program objectives were moderately hindered, while 17 percent saw no effect. Also, almost 90 percent of the program responses indicated that general revenue sharing had no effect on the appropriation level for their program and almost two-thirds felt that states and localities did not use general revenue sharing funds to meet their program requirements (e.g., matching requirements).

In a related question, 44 percent of the respondents felt greater recognition should be given to the financial capacity of state and local governments; 7 percent said lesser recognition should be given and 49 percent said no change should be made. Thus mixed feelings were voiced by Federal administrators regarding whether or not program funds should be distributed (or matching requirements determined) by placing more emphasis on the recipient's financial situation and "ability to pay".

Finally, only 7 percent of the program responses indicated that their grant program was involved in a merger of grant programs between 1970-1975; about half of these felt the merger did not affect achievement of any of the objectives and about half of these felt that some objectives were enhanced and others retarded. On a similar question, approximately one-fourth of the respondents indicated that their agency had specific plans to cooperate with other agencies in a jointly funded project of their program. Hence, achievement of a state's or locality's "need" by using Federal funds from a number of similar programs was not actively fostered, according to these responses.

B.3.2 Part II Results

Part II of the ACIR survey pertained to categorical programs only. The first question listed 34 principal elements considered necessary for the design and administration of categorical grant programs to make them effective and foster healthy intergovernmental relations. These elements were developed by the ACIR staff from observation of the grant programs and a study of the literature. Federal administrators were asked to provide their judgments on the degree to which their respective grant programs could be improved. The two elements where substantial improvement was seen as necessary concerned authorizations and appropriations to achieve program objectives and to adequately administer the program.

Elements where little improvement was seen to be necessary included:

- Appropriateness of eligible recipients;
- Apportionment formula and matching requirements consistent with statutes;
- Sensitivity by Congress to possible program impact on state and local governments when legislation was designed;
- Consultation by Congress with state and local governments in preparing legislation;
- Awareness by Congress not to undermine the role of local governments;
- Agency preference to award projects to general purpose local governments; and
- Agency striving to give recipients maximum access to policy makers for expediting actions and rendering policy decisions.

However, there were other elements indicative of state and local participation where Federal administrators felt some improvement was necessary:

- Consultation by agency with state and local governments in preparing rules and regulations or in seeking advice on changing rules and regulations;
- Provision of necessary technical assistance by the agency;

- Clarity of regulations/guidelines and policy interpretations;

- Recipients effectively coordinating grant-in-aid activity with other state and local activities; and

- Agency seeking coordination with other departments and agencies affecting recipients' overall programs.

Thus, as viewed by Federal administrators, it appears that state and local governments are sufficiently involved when PWI programs are being considered by Congress. However, when rules and regulations are being developed to implement these programs, state and local governments become less than optimally involved. Moreover, agencies do not sufficiently coordinate their PWI programs with other agency programs.

In another question, Federal administrators overwhelmingly felt that special revenue sharing or block grants would not help state and local governments to meet their needs more effectively than categorical programs in the various program areas.

B.3.3 Part III Results

This part of the ACIR survey pertained to formula grant programs only. It was indicated that the formulae used to distribute funds for the formula grant PWI programs were all based on statute, and one-third were further developed through regulations.

Another important question posed to Federal administrators of formula grant programs concerned the degree to which authority for the program was decentralized to the regional/area offices since 1969. Such an occurrence would tend to indicate that state and local government participation would be enhanced, since decision making was moved closer to the recipients. Approximately half the programs indicated that authority to approve and disapprove plans and plan amendments was delegated to the regional office since 1969. Thus, state and local participation would appear to be gaining.

B.3.4 Part IV Results

Part IV of the ACIR survey pertained to project (discretionary) grant programs only. A similar question asked in Part III concerning decentralization of program activities was also asked here. The respondents indicated that for almost 80 percent of the programs, since 1969, authority to review grant applications had been delegated to the regional/area offices. However, only about half the programs allow regional offices to approve grant applications or to commit grant funds.

In an effort to evaluate the role of state and local governments in the grant system, the ACIR first asked respondents whether or not applications were channeled through the state rather than coming from local governments directly. Two-thirds of the respondents said local government applications were channeled through the state, but that local participation was not affected for almost 85 percent of the programs. This channeling did, however, substantially reduce local participation in 11 percent of the programs.

Another question related to channeling, concerned whether or not program funds passed through the state to local governments. Only 25 percent of the respondents said that funds are channeled through the state and, in these situations, all respondents said local participation was not affected.

Thus, states appear to provide a good deal of input when it comes to suggesting what projects should receive Federal grant funds, but much less control over the expenditure of funds once obligated to a particular local government.

The program responses also indicated that 80 percent of the project grant programs publish procedures to be followed by potential grant recipients in applying for a grant (41 percent publish as a result of statutory or regulatory requirements). However, only half the programs publish criteria or standards (and priorities among these) to be used for the selection of grantees under the grant program (about 60 percent publish due to statutory or regulatory requirements). Thus, many Federal PWI programs do not provide potential recipients with a clear understanding of how to apply for grant funds, and one half of the program do not tell potential recipients, explicitly, what criteria they use in selecting projects for grant funds.

B.4 Survey Results for Selected PWI Programs

In this subsection, individual responses are summarized (in tabular form) for ten of the 45 programs; these correspond to nine of the 17 programs discussed earlier in this task (see Exhibit B.3).

The ten programs included here are:[1]

- Department of Agriculture:
  - Farmers Home Administration, Water and Waste Disposal Systems for Rural Communities (10.418);
  - Soil Conservation Service, Watershed Protection and Flood Prevention (10.904);

[1]The code numbers attached to each program are those assigned by the Office of Management and Budget (OMB) in their Catalog of Federal Domestic Assistance.

Exhibit B.3: Correspondence Between Seventeen PWI Programs for This Task Effort with Ten PWI Programs in the ACIR Survey

Seventeen PWI Programs for This Task Effort	Ten PWI Programs in the ACIR Questionnaire									
	10.418	10.904	11.300	11.304	14.477	15.503	16.501	20.102	20.205	20.507
Economic Development Programs										
. Rural Community Facilities Program/ Farmers Home Administration, USDA		√								
. Economic Development Grants/Economic Development Administration, Department of Commerce*			√	√						
. Community Development Block Grants and Loans (and predecessor categorical programs)/Department of Housing and Urban Development*										
Health and Education Programs										
. Financial Assistance for School Construction in Federally Affected Areas/Office of Education, Department of Health, Education and Welfare										
. Construction, Reconstruction and Renovation of Academic Facilities/Office of Education/ Department of Health, Education and Welfare										
. Hill Burton Hospital (and other health facilities) Construction and Renovation Program/ Health Resources Administration, Department of Health, Education and Welfare										
Law Enforcement Programs										
. Federal Prison Construction/Bureau of Prisons, Department of Justice							√			
. Law Enforcement Assistance to State and Localities for Strengthening Law Enforcement and Criminal Justice/Law Enforcement Assistance Administration, Department of Justice					√					

√ - Indicates correspondence between programs.

Exhibit B.3: Correspondence Between Seventeen PWI Programs for This Task Effort with Ten PWI Programs in the ACIR Survey (continued)

Seventeen PWI Programs for This Task Effort	Ten PWI Programs in the ACIR Questionnaire									
	10.418	10.904	11.300	11.304	14.477	15.503	16.501	20.102	20.205	20.507
Transportation Programs										
• Airport Development Aid Program/Office of Airports, Federal Aviation Administration, Department of Transportation								√		
• Federal Aid Highway Program/Federal Highway Administration, Department of Transportation									√	
• Railroad Rehabilitation and Improvement Loan Program/Federal Railroad Administration, Department of Transportation										
• UMTA Capital Improvement Grants and Loans (Formula and Project)/Urban Mass Transit Administration, Department of Transportation										√
Water Supply - Wastewater Treatment Programs										
• Water and Waste Disposal Systems for Rural Communities/Farmers Home Administration, Department of Agriculture	√									
• Construction Grants for Wastewater Treatment Works/Environmental Protection Agency										
Watershed - Flood Prevention Programs										
• Watershed Protection and Flood Prevention/Soil Conservation Service/Department of Agriculture										
• Flood Control, Navigation and Multiple Purpose Projects with Power Facilities/Army Corps of Engineers, Department of Defense										
• Irrigation and Multiple Purpose Projects with Power Facilities/Bureau of Reclamation, Department of the Interior						√				

- Department of Commerce:
  - Economic Development Administration, Economic Development - Grants and Loans for Public Works and Development Facilities (11.300);
  - Economic Development Administration, Economic Development - Public Works Impact Projects (11.304);
- Department of Health, Education and Welfare:
  - Office of Education, School Assistance in Federally Affected Areas - Construction (14.477);
- Department of the Interior:
  - Bureau of Reclamation, Small Reclamation Projects (15.503);
- Department of Justice:
  - Law Enforcement Assistance Administration, Law Enforcement Assistance - Discretionary Grants (16.501);
- Department of Transportation:
  - Federal Aviation Administration, Airport Development Aid Program (20.102);
  - Federal Highway Administration, Highway Research, Planning and Construction (20.205); and
  - Urban Mass Transportation Administration, UMTA Capital and Operating Assistance (20.507).

Responses to the ACIR survey by the Federal administrator of each of these ten programs are presented in Exhibits B.4 through B.6. As before, only those questions of particular interest to this study are included. Significant findings from these responses have been noted both in the project summaries (Addendum A) as well as in the main text (Section 4.4 primarily), when appropriate.

Exhibit B.4: Summary of Selected Part I Responses to the 1975 ACIR Survey For Selected PWI Programs

PWI Program		Questions in Survey						
		Q. 5 Financial Capacity of State and Local Government - Greater Recognition Needed - Lesser Recognition Needed - No Change Needed	Q. 7(a) Threat of Withholding Funds - Yes - No	Q. 7(b) Actual Withholding of Funds - Yes - No	Q. 13 Cooperate on Joint Funding - Yes - No	Q. 15(a) Have Had Funds Impounded - Yes - No	Q. 15(b) Percent Impounded	Q. 15(c) Effect on Achieving Objectives - Seriously Hindered - Moderately Hindered - No Appreciative Effect
10.418	Water and Waste Disposal Systems for Rural Communities	No Change	Yes	Yes	Yes*	Yes	*	Serious
10.904	Watershed Protection and Flood Prevention	No Change	Yes	Yes	Yes*	Yes	4.4	Moderate
11.300	Economic Development Grants and Locals for Public Works and Development Facilities	Lesser	Yes	Yes	Yes	No	N/A	N/A
11.304	Economic Development - Public Works Impact Projects	Lesser	Yes	Yes	--	No	N/A	N/A
13.477	School Assistance in Federally Affected Areas - Construction	Greater	No	No	No	Yes	2.5	Moderate
15.503	Small Reclamation Projects	No Change	No	No	No	Yes	10	Moderate
16.501	Law Enforcement Assistance - Discretionary Grants	Greater	Yes	Yes	Yes*	No	N/A	N/A
20.102	Airport Development Aid Program	No Change	Yes	Yes	No	No	N/A	N/A
20.205	Highway Research, Planning and Construction	No Change	Yes	Yes	Yes*	Yes	25	Serious
20.507	UMTA Capital and Operating Assistance	Greater	No	No	No	No	N/A	N/A

*Provided a written comment.

NA - Not Applicable
-- - No Response Given

Exhibit B.5: Summary of Selected Part II Responses to the 1975 ACIR Survey For Selected PWI Programs

	PWI Program	Questions in Survey														
		Q. 2 Grant recipients are appropriate	Q. 4 Apportionment formula consistent with statutes	Q. 5 Budget adequate	Q. 10 Congress reviews statutes as necessary	Q. 12 Regulations consistent with legislative intent	Q. 13 Regulations clear	Q. 18 Technical assistance provided	Q. 23 Recipient coordinates program with other programs in state	Q. 24 Congressional concern for state/local impact	Q. 25 Congress consults with state/local government in preparing legislation	Q. 26 Congress consults with state/local government in changing legislation	Q. 28 Consistent with local governments role	Q. 29 Agency consults with state/local government on regulations	Q. 30 Agency consults with state/local government on changes to regulations
10.418	Water and Waste Disposal Systems for Rural Communities	3	3	3	3	3	3	3	3	3	3	3	3	3	3
10.904	Watershed Protection and Flood Prevention	3	-	1	2	3	3	2	2	3	3	3	3	3	3
11.300	Economic Development Grants and Loans for Public Works and Development Facilities	3	3	1	3	3	3	3	2	3	3	-	3	1	1
11.304	Economic Development - Public Works Impact Projects	3	-	1	3	3	3	3	3	3	3	-	3	-	2
13.477	School Assistance in Federally Affected Areas - Construction	3	3	1	3	2	3	2	3	3	3	2	3	3	2
15.503	Small Reclamation Projects	3	3	3	3	1	1	3	3	NA	3	3	3	3	3
16.501	Law Enforcement Assistance - Discretionary Grants	2	3	1	3	2	2	1	1	2	3	3	3	2	2
20.102	Airport Development Aid Program	3	3	2	3	3	2	2	2	2	3	3	3	3	3
20.205	Highway Research, Planning and Construction	3	3	2	2	3	2	3	3	3	3	3	3	2	3
20.507	UMTA Capital and Operating Assistance	3	3	2	NA	3	2	1	2	3	3	NA	3	2	3

1 - Substantial Change Needed
2 - Moderate Change Needed
3 - Is about as good as it could be
NA - Not Applicable
- - No Response Given

Exhibit B.6: Summary of Selected Part III and Part IV Responses to the 1975 ACIR Survey for Selected PWI Programs

PWI Program		Questions in Survey																		
		III				IV														
		Q. 1 Formula in Law, Status or Both	Q. 2(a)(6) Regions Can Approve Plans and Amendments - Yes - No	Q. 2(a)(7) Regions Can Disapprove Plans and Amendments - Yes - No	Q. 2(a)(8) Region Has Major Program Review Responsibility - Yes - No	Q. 1(a)(6) Region Reviews Grants - Yes - No	Q. 1(a)(7) Region Approves Grants - Yes - No	Q. 1(a)(8) Region Commits Funds - Yes - No	Q. 1(a)(9) Region has Program Review Responsibility - Yes - No	Q. 2(a) Project Applications Go Through State - Yes - No	Q. 2(b) If Yes, Affect on Local Participation - Substantial - Moderate - No Affect	Q. 3(a) Funds Channel Through State - Yes - No	Q. 3(b) If Yes, Required by Law or Regulation - Yes - No	Q. 3(c) If Yes, Effect on Local Participation - Substantial - Moderate - No Affect	Q. 4(a) Application Procedures Published - Yes - No	Q. 4(c) If Yes, Required by Law or Regulation - Yes - No	Q. 6(a) Project Criteria Published - Yes - No	Q. 6(c) If Yes, Required by Law or Regulation - Yes - No
10.418	Water and Waste Disposal Systems for Rural Communities	N/A	N/A	N/A	N/A	Yes	Yes	Yes	Yes	No	N/A	No	N/A	N/A	Yes	Yes	Yes	Yes		
10.904	Watershed Protection and Flood Prevention	N/A	N/A	N/A	N/A	--	--	--	--	Yes	No	N/A	N/A	N/A	Yes	Yes	No	N/A		
11.300	Economic Development Grants and Locals for Public Works and Development Facilities	N/A	N/A	N/A	N/A	Yes	No	Yes	Yes	No	N/A	No	N/A	N/A	Yes	--	--	--		
11.304	Economic Development - Public Works Impact Projects	N/A	N/A	N/A	N/A	Yes	No	Yes	Yes	No	N/A	No	N/A	N/A	Yes	Yes	--	--		
13.477	School Assistance in Federally Affected Areas - Construction	N/A	N/A	N/A	N/A	Yes	Yes	No	Yes	Yes	No	No	N/A	N/A	Yes	No	Yes			
15.503	Small Reclamation Projects	N/A	N/A	N/A	N/A	No	No	No	No	No	N/A	No	N/A	N/A	Yes	No	No	N/A		
16.501	Law Enforcement Assistance - Discretionary Grants	N/A	N/A	N/A	N/A	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	◊		
20.102	Airport Development Aid Program	N/A	N/A	N/A	N/A	Yes	Yes	Yes	Yes	No	N/A	No	N/A	*	No	N/A	No	N/A		
20.205	Highway Research, Planning and Construction	Statute	Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
20.507	UMTA Capital and Operating Assistance	Statute	Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		

N/A - Not Applicable
-- No Response Given

B.5 Detailed Results for Selected Questions in the 1975 ACIR Survey of Federal Administrators of Grant Programs for the U.S. Federal PWI Programs

Questionnaire Survey on the Administration of Federal Grants to State and Local Governments

The questionnaire is divided into four sections according to whether the questions relate to:

• All Grant Programs	Section I
• Formula and Project Grant Programs (not block grants)	Section II
• Formula Grant Programs Only	Section III
• Project Grant Programs Only	Section IV

We request that you answer and return all sections which apply to the program named on the preceding sheet. Example: if the program involves a project grant, complete Sections I, II and IV.

The term "grants" as used in the questionnaire refers only to grants to state and local governmental units (and agencies thereof), not to grants which go only to other recipients, such as individuals or private agencies.

The several kinds of grant are defined as follows:

(1) Block grants consist of the non-discretionary grants under the Safe Streets, Partnership for Health, Comprehensive Employment and Training, Housing and Community Development, and Social Services acts.

(2) Categorical grants consist of all the remaining grants (other than general revenue sharing). For this questionnaire, they are of two general types:

a. Formula grants -- entitlement is determined according to a formula established by statute or regulation; and

b. Project grants -- given in response to an application. Sometimes called "discretionary".

I. FOR ALL GRANT PROGRAMS

5. Do you believe that this program should give greater or lesser recognition to variations in the financial capacity of state and local governments?

Greater	44.4%
Lesser	6.7%
No Change	48.9%

7. (a) Has your agency, within the last five years, initiated formal action to withhold funds or suspend payments in this program because of state or local unwillingness or inability to comply with statute or regulations?

Yes	42.2%
No	57.8%

(b) Has your agency, within the last five years, actually withheld funds or suspended payments in such cases?

Yes	40.0%
No	60.0%

12. Congress has occasionally consolidated two or more small grants into a package short of a block grant. Examples are the libraries and learning resources program and the educational support and innovation program (PL 93-380, Title IV).

(a) Has your grant program been involved in such a merger in the past five years?

Yes	6.7%
No	93.3%

(c) If yes, how would you rate the effects of the consolidation in terms of the achievement of the objectives of the individual programs consolidated (Check one).

Enhanced achievement of all the separate objectives	0%
Enhanced achievement of some, did not appreciably affect achievement of others	0%

Did not appreciably affect achievement of any of the objectives 50%

Enhanced achievement of some, retarded the achievement of others 50%

Retarded achievement of all objectives 0%

13. Pursuant to the 1974 Joint Funding Simplification Act (PL 93-510), does your agency have specific plans to cooperate with one or more other agencies in a jointly funded project involving this program?

Yes	26.2%
No	73.8%

15. (a) Have appropriations for this program been subject to impoundment in the past 10 years?

Yes	37.5%
No	62.5%

(b) If "Yes" what was the approximate percentage of appropriations impounded over the total 10 year period?

Ranged from less than 1% to 50%

(c) If "Yes", please indicate how in your judgment, the impoundments have affected achievement of this program's statutory objectives during this period:

Seriously hindered	27.8%
Moderately hindered	55.5%
No appreciable affect	16.7%

16. (a) What effect do you think general revenue sharing has had on the appropriation for this grant program?

Caused reduction	11.1%
No effect	88.9%
Caused increase	0.0%

(b) In your opinion, to what extent have states and localities met this program's needs by using general revenue sharing funds for that purpose?

Substantial	4.5%
Moderate	0.0%
Small	31.8%
Not at all	63.7%

II. FOR CATEGORICAL (FORMULA AND PROJECT) GRANT PROGRAMS[1]

1. Below are listed principal elements considered necessary for the design and administration of categorical grant programs so that they are effective and foster healthy intergovernmental relations. Please indicate your judgment on the degree to which this program could be improved with respect to each element by circling the appropriate number, as follows: (1) could be substantially improved; (2) could be moderately improved; or (3) is about as good as it could be.

	Percent of Those Responding		
	1	2	3
1) Program purposes are clearly defined in statute	0	39.5	60.5
2) Eligible recipients are appropriate for program and clearly defined in statute	0	7.0	93.0
3) Degree of administrative discretion for implementation of Congressional intent is clearly specified in statute	7.0	27.9	65.1
4) Apportionment formula and/or matching ratio are consistent with statutory purpose	7.9	5.3	86.8
5) Authorization and appropriation are adequate to achieve purpose	58.1	23.3	18.6
6) Appropriation for administration and authorization for staff are adequate for implementation	41.8	30.2	28.0
7) Statutory reporting, accounting, and auditing requirements are adequate for control	11.6	11.6	76.8
8) Statutory performance requirements are consistent with program purpose	14.3	4.8	80.9

[1]Generally represents responses from 37-43 of the 45 programs.

		Percent of Those Responding		
		1	2	3
9)	Reviews by substantive and appropriations committee of Congress are adequate	7.5	17.5	75.0
10)	Congress makes needed and timely revision of authorizing statute	10.3	20.5	69.2
11)	Regulations, guidelines, and policy interpretation are adequate to carry out Congressional intent	16.3	20.9	62.8
12)	Regulations, guidelines, policy interpretation give recipients maximum discretion consistent with achieving Congressional intent	16.3	18.6	65.1
13)	Regulations, guidelines, and policy interpretations are clear	16.3	27.9	55.8
14)	Agency issues regulations, guidelines and policy interpretations expeditiously	11.6	48.8	39.5
15)	Processing of applications, plans and other documents is expeditious	4.5	40.9	54.6
16)	Agency's reports to Congress on program's strengths and weaknesses are submitted in timely fashion	15.8	10.5	73.7
17)	Agency proposes necessary statutory changes to Congress	18.4	21.1	60.5
18)	Agency provides necessary technical assistance	12.8	53.3	53.8
19)	Agency effectively monitors recipients' conformance with plans, procedural requirements, and performance standards	14.3	42.9	42.8
20)	Monitoring assures that funds intended to be additive are not substitutive	16.2	18.9	64.9

		Percent of Those Responding		
		1	2	3
21)	State and local recipients employ adequate organization and staff	20.9	44.2	34.9
22)	When funds to localities are channeled through the State, good local performance is fostered by the State through addition of funds, technical assistance, or setting of higher standards	35.7	39.3	25.0
23)	Recipients effectively coordinate grant-aided activity with other state or local activities	20.5	46.2	33.3
24)	Congress was sensitive to possible program impact on state and local governments in designing the legislation	4.8	9.5	85.7
25)	Congress consulted with state and/or local governments in preparing legislation	7.5	5.0	87.5
26)	Congress seeks advice of state and local governments in making legislative changes	8.6	20.0	71.4
27)	Congress makes efforts to avoid fluctuation of funding	20.5	7.7	71.8
28)	In designing the program, Congress was careful not to undermine the role of general purpose units of local government and elective, generalist policy makers	2.4	2.4	95.2
29)	Agency consults with local governments in preparing regulations and guidelines	12.5	30.0	57.5
30)	Agency seeks state and local advice on changes in regulations and guidelines	14.3	19.0	64.3
31)	Agency strives to give recipients maximum access to policy makers for expediting actions and rendering policy decisions	4.7	14.0	81.3

	Percent of Those Responding		
	1	2	3
32) Agency seeks active coordination with other departments and agencies affecting recipients' overall programs	16.3	27.9	55.8
33) Agency gives preference to general purpose local units and elective general policy makers	0	9.1	90.9
34) Within statutory limits, agency strives to stimulate program innovation	5.1	20.5	74.4

3. (a) Would special revenue-sharing or block grants rather than narrow categorical grants and/or the provisions for transfer of funds between narrow categorical grants help states and local governments to meet their needs more effectively in the area of this program?

Yes	12.2%
No	87.8%

(b) Would provision for transfer of funds between narrow categorical grants help?

Yes	37.5%
No	62.5%

III. FOR FORMULA GRANT PROGRAMS ONLY[1]

1. Is the formula used to distribute funds in this program based on statute, regulation or both?

Statute	63.6%
Regulation	0.0%
Both	36.4%

2. (a) The FAR program included measures to decentralize authority to the regions. Please indicate which of the following statements apply to developments in this program since 1969:

[1]Generally represents responses from 11 of the 45 programs.

6) Delegation to regional/area office of authority to approve plans and plan amendments

Yes	54.5%
No	45.5%

7) Delegation to regional/area offices of authority to disapprove plans and plan amendments

Yes	54.5%
No	45.5%

IV. FOR PROJECT GRANT PROGRAMS ONLY[1]

1. (a) The FAR program included measures to decentralize authority to the regions. Please indicate which of the following statements apply to developments in this program since 1969:

6) Delegation to regional/area office of authority to review grant applications

Yes	78.6%
No	21.4%

7) Delegation to regional/area office of authority to approve grant applications

Yes	55.4%
No	44.6%

8) Delegation to regional/area office of authority to commit grant funds

Yes	57.9%
No	42.9%

2. (Only for administrators of project grants that have local government recipients)

(a) Do applications for this program channel through the state rather than come directly from local governments?

Yes	66.1%
No	33.9%

[1]Generally represents responses from 28-31 of the 45 programs.

(b) If "Yes" to (a), to what extent has channeling affected local participation?

Substantially reduced	10.5%
Moderately reduced	5.3%
No effect	84.2%

3. (Only for administrators of project grants that have local government recipients)

(a) Do your aid funds channel through the state rather than go directly to local governments?

Yes	25.0%
No	75.0%

(b) If "Yes" to (a), is channeling required by Federal statute or regulation?

Yes	50.0%
No	50.0%

(c) If "Yes" to (a), to what extent has channeling of funds affected local participations?

Substantially reduced	0.0%
Moderately reduced	0.0%
No effect	100.0%

4. The Administrative Conference of the United States (ACUS) has recommended that agencies administering discretionary (project) grants should publish the procedures to be followed by potential grant recipients in applying for a grant.

(a) Has your agency published such procedures for this program?

Yes	80.6%
No	19.4%

(b) If "Yes", is such publication required by statute or regulation?

Yes	40.9%
No	59.1%

6. The ACUS further recommended that agencies administering project grants should publish criteria or standards, and priorities among criteria or standards, for the selection of grantees under each grant program.

(a) Has your agency issued such publications for this program?

Yes	51.7%
No	48.3%

(b) If "Yes", is publication required by statute or regulation?

Yes	58.3%
No	41.7%

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